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NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
PENTUCKET POND OUTLET (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV OCT 79

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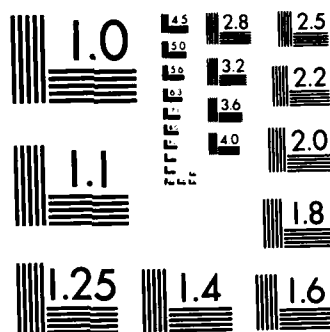
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PARKER RIVER BASIN
GEORGETOWN, MASSACHUSETTS

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PENTUCKET POND OUTLET
MA 00261

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

JAN 16 1980

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Pentucket Pond Outlet Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, town of Georgetown.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,


MAX B. SCHEIDER

Colonel, Corps of Engineers
Division Engineer

Incl
As stated

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

A154 487

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Pentucket Pond Dam is an earthfill embankment about 250 ft. long which has a maximum height of about 8 ft. There are several deficiencies that must be corrected but generally the dam is in fair condition. The dam is small and has a significant hazard potential level. It is recommended that a professional engineer be employed to conduct a more detailed hydraulic investigation.		

PENTUCKET POND OUTLET

MA 00261

PARKER RIVER BASIN
GEORGETOWN, MASSACHUSETTS

PHASE I - INSPECTION REPORT
NATIONAL DAM INSPECTION
PROGRAM



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NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA 00261

Name of Dam: Pentucket Pond Outlet

Town: Georgetown

County and State: Essex County, Massachusetts

Stream: Parker River

Date of Inspection: April 16, 1979

Pentucket Pond Dam is an earthfill embankment about 250 feet long which has a maximum height of about 8 feet. The top of the dam varies from elevation (El) 81.8 to 83.6. A concrete outlet structure through the dam contains a spillway and fish ladder. The spillway is an ungated, ogee-type weir about 6.5 feet long with the crest at El 77.0. The fish ladder is 1.8 feet wide with its crest at El 76.6. A bridge deck for Pond Street spans the outlet. There is no low level or regulating outlet in this dam.

Based upon the visual inspection of the site, the limited design data, past inspection records and the lack of maintenance procedures, there are several deficiencies which must be corrected to assure the continued performance of this dam. Generally, the dam is in "fair" condition.

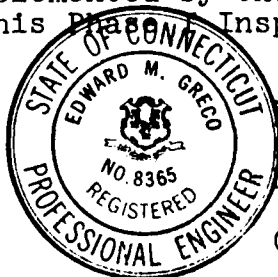
The following signs of distress were observed at the site: sloughing and erosion of embankment slopes adjacent to the outlet structure and at the toe of the downstream slope, failure of riprap on the upstream slope of the dam, and the deterioration of concrete in the outlet structure. In addition, other maintenance functions such as control of vegetation, pavement repair, and clearing debris from the downstream channel have not been undertaken.

PENTUCKET POND

Based on Corps of Engineers' guidelines, the dam has been classified as "small" and in the "significant" hazard category. The drainage area is approximately 7.5 square miles. A test flood equal to one-half the probable maximum flood (PMF) was used to evaluate the capacity of the spillway. Hydraulic analyses indicate that the spillway and fish ladder can discharge a combined flow of 330 cfs (cubic feet per second) when the water surface is at El 81.8, which is the low point on the top of the dam. A test flood outflow (one-half PMF) of 2,510 cfs with the pond at El 84.4 will overtop the dam by a maximum of 2.6 feet. The spillway and fish ladder can discharge only 14 percent of the test flood without flow overtopping the dam.

It is recommended the Owner employ the services of a qualified engineering consultant to conduct a more detailed hydraulic and hydrologic investigation to evaluate the discharge capacity of the spillway and to design a low level outlet. In addition, it is recommended that the Owner repair the deficiencies listed above, as described in Section 7.3. The Owner should also implement programs of maintenance and annual technical inspections, a plan for surveillance of the embankment during and after periods of heavy runoff, and a plan for notifying nearby residents in the event of an emergency at the project.

The measures outlined above and in Section 7 should be implemented by the Owner within one year of receipt of this Final Inspection Report.



Edward M. Greco
Edward M. Greco, P.E.
Project Manager
Metcalf & Eddy, Inc.

Connecticut Registration
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Approved by:

Stephen L. Bishop
Stephen L. Bishop, P.E.
Vice President
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Massachusetts Registration
No. 19703



PENTUCKET POND

This Phase I Inspection Report on Pentucket Pond Outlet has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

Joseph W. Finegan
JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, CHAIRMAN
Chief, Structural Section
Design Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar
JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general conditions and the downstream damage potential.

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**OVERVIEW
PENTUCKET POND OUTLET
GEORGETOWN, MASSACHUSETTS**



SECTION 4

OPERATING PROCEDURES

- 4.1 Procedures. There are no operating procedures performed at this dam.
- 4.2 Maintenance of Dam. The dam is not regularly maintained. Trees and brush have overgrown the slopes of the dam. The riprap has failed adjacent the outlet. Some erosion of the embankment has occurred adjacent to the outlet. Severe spalling of concrete deck facia is evident.
- 4.3 Maintenance of Operating Facilities. At present there are no operating mechanisms at the dam.
- 4.4 Description of Any Warning System in Effect. There are no warning systems in effect at this dam.
- 4.5 Evaluation. There are no operating, maintenance or warning systems in effect at Pentucket Pond Dam. This is undesirable considering the dam is in the "significant" hazard category. A program of inspection and maintenance, and a surveillance system for this dam should be implemented as recommended in Section 7.3.

Pentucket Pond is a deep, natural pond whose volume was increased when the dam and outlet were constructed. The deepest point in the pond is reported to be at the east end which is about 34 feet deep. This information was taken from a plan showing Pentucket Pond bottom contours prepared by the Massachusetts Department of Public Works dated January 1932. A large portion of the pond storage is below the 8-foot high dam embankment. Failure of the dam would only affect 620 acre-feet of the pond's storage capacity.

PENTUCKET POND

two culverts under Mill Street. Below the road, the Parker River flows through a gravel pit. There are numerous trees overhanging the discharge channel. Some trees are at the edge of the channel which, in the event of a storm, could fall into the stream and result in debris blocking the channel.

- 3.2 Evaluation. The above findings indicate that the dam is in fair condition, however, there are several deficiencies which require attention. It is apparent that there are no established maintenance procedures regularly implemented at this dam. Recommended measures to improve these conditions are stated in Section 7.3.

PENTUCKET POND

severely. At both ends two 3/4-inch diameter reinforcing rods are exposed and rusted at the bottom edge of the fascia. Some cracks are visible where the concrete is severely eroded.

Comparison of the drawings and the existing conditions indicate the fish ladder has been altered since the outlet has been rebuilt in 1965. Presently, the fish ladder is constructed of 2 x 6 and 1 x 4 timbers forming two pockets about one foot on center for the length of the fishway. The original design consisted of planks two feet on center (see Figure B-4).

Some erosion of the concrete is evident at and above the water level on the training walls, especially where the flow is constricted. The tops of the footings of the downstream wing walls were visible in the streambed. There are several trees overhanging the downstream slopes and the discharge channel. An old boat pier was washed up on the left bank of the downstream channel just below the outlet.

There is no low level outlet at this dam.

- d. Reservoir Area. The area around Pentucket Pond is sparsely developed except in the immediate vicinity of the shoreline and in the Town of Georgetown. The drainage area is mostly wooded and swampy. It is gently rolling with moderately steep slopes on the outlying hills. The average slope of the drainage area is less than one percent. Rock Pond, which is southwest of Pentucket Pond, drains via the Parker River into Pentucket Pond. A stream gauge installed by a local Conservation Commission was located on the Parker River just upstream of the West Main Street (Route 97) culvert. The water level was at El 79.2 on the day of the inspection.
- e. Downstream Channel. Discharge from the outlet flows through a low, swampy area just below the outlet and through a 10-foot wide opening in an abandoned railroad embankment. The channel is then split into two streams by a small earth dike. These streams flow through

PENTUCKET POND

No cracks were observed on the shoulders. The cracks average about 3/4-inch wide. A poorly maintained chain-link fence is located at the shoulders of the roadway.

There are trees and brush growing on both the upstream and downstream slopes. Some trees are growing within the riprap.

Houses are located on both abutments. The abutments appear to be partially natural and man-placed fills for the houses. Trees and brush are also located on the downstream slopes of the abutment at the edge of the swamp. An 8-inch diameter vitrous clay pipe, assumed to be either a roadway or foundation drainage outlet, is located within the right abutment and discharges into the channel about 25 feet downstream of the dam (see Figure B-1). A concrete block wall, which is about 2 feet high and in fair condition, is located at the toe of the upstream slope of the right abutment.

- c. Appurtenant Structures. The outlet consists of sloping training walls with approach and exiting wing walls. The abutment walls support the roadway deck. The concrete spillway and timber fish ladder are located between the training walls on the upstream side of the bridge. The spillway is an ungated ogee-type weir about 6.5 feet long. The spillway crest is at El 77.0. The fishway is 1.8 feet wide and has a crest at El 76.6. The bridge deck is comprised of slabs of granite about 2 feet wide. The bottom of these slabs are rough cut. Under the bridge decks both the upstream and downstream training walls are joined by mortared stone sidewalls. The channel bottom at the spillway and under the roadway is stone lined.

The bridge deck has a concrete facia at both the upstream and downstream ends. The concrete facia on the upstream side is severely eroded, spalled and deteriorated with some efflorescence visible. The downstream facia has been eroded and is also spalled but not as

PENTUCKET POND

SECTION 3
VISUAL INSPECTION

3.1 Findings

- a. General. The Phase I inspection of the dam at Pentucket Pond was performed on April 16, 1979. A copy of the inspection checklist is included in Appendix A. Previous inspection reports by Essex County personnel are included in Appendix B. Notes from a more recent inspection by the Massachusetts Department of Public Works, District 5 personnel are also included in Appendix B.
- b. Dam. Pentucket Pond Dam consists of an earth-fill embankment with a concrete outlet structure containing an ogee-type spillway and fish ladder. The outlet structure was rebuilt in 1965 at the same location of the previous outlet.

The dam embankment appears to be in fair condition, however, several signs of distress were noted at the site. Sloughing or erosion of the embankment was evident along both the upstream and downstream training walls of the outlet. The riprap on the upstream slope, especially at the outlet, has either failed or totally been removed. Some sloughing was also observed at the toe of the downstream slope along the edge of the swamp.

There were two minor wet spots on the downstream slope located within 100 feet of the left abutment and about halfway up the slope. Water was not observed either flowing or ponded so that these may have resulted from surface runoff.

There has been some settlement of the top of the dam, as indicated by the poor condition of the pavement. Longitudinal and "alligator-type" cracks cover the entire roadway.

PENTUCKET POND

2.4 Evaluation

- a. Availability. There is no engineering data available for this dam. There is limited engineering data available on the design of the outlet.
- b. Adequacy. The available hydraulic and structural data were reviewed. The evaluation of the adequacy of this dam is based on review of available drawings and preliminary engineering notes, visual inspection, past performance history and engineering judgment
- c. Validity. Comparison of the available drawings with the field survey conducted during the Phase I inspection indicates that the available information is valid.

SECTION 2

ENGINEERING DATA

- 2.1 General. There are no known plans, specifications or computations available from the Owner, County or State offices relative to the design of the original dam. However, there were two drawings available in the files of Charles H. Morse and Son, Engineers for rebuilding the outlet. The files are in the custody of Mr. Everett Raymond of Haverhill, Massachusetts. The first plan (Figure B-4) dated August 5, 1963 shows the existing and proposed outlet. The later plan (Figure B-3) dated June 11, 1964 is a supplemental plan showing the proposed fishway for the outlet. A copy of both plans are included in Appendix B. There were no specifications or as-built drawings available. A limited amount of quantity estimates and preliminary hydraulic and structural stability notes were also reviewed for this report.

We acknowledge the assistance and cooperation of the personnel of the Massachusetts Division of Waterways, the Massachusetts Department of Public Works, and the Essex County Engineers Office.

In addition, we thank Mr. Joseph A. Saucy of the Town of Georgetown who provided information on the history and operation of the dam.

We also acknowledge the assistance of Mr. Everett Raymond, custodian of the Morse and Son Engineering files, who provided the drawings prepared in 1963 and 1964.

- 2.2 Construction Records. There are no as-built drawings for the dam, spillway or outlet structures.
- 2.3 Operating Records. No operating records are available, and there is no daily record kept of the elevation of the pool or rainfall at the dam site.

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- (5) Side slopes: upstream - 2:1
downstream - 3.0 to 5.5:1
- (6) Zoning: Unknown
- (7) Impervious core: Unknown
- (8) Cutoff: Unknown
- (9) Grout curtain: Unknown

1. Spillway

- (1) Type: ogee
- (2) Length of weir: 6.5 feet
- (3) Crest elevation: 77.0 MSL (assumed benchmark)
- (4) Gates: None
- (5) Upstream channel: concrete wing wall; bottom is sand and gravel
- (6) Downstream channel: concrete wing walls and bottom lined with stone beneath Pond Street; downstream of dam, channel is a natural streambed.
- (7) General: 10-foot wide opening in railroad embankment approximately 500 feet downstream of dam. Two culverts under Mill Street approximately 1,500 feet downstream. The westerly culvert is 11.5 feet wide by 5.75 feet high and the easterly culvert is 8.6 feet wide by 5.75 feet high (dimensions taken at downstream side of culvert).

- j. Regulating Outlets. There are no regulating outlets at the dam. However, the spillway crest can be elevated a maximum of one foot with the addition of stop logs. Stop logs can also be added to the same level in the fish ladder.

PENTUCKET POND

d. Reservoir

- (1) Length of maximum pool: 3,700 feet
- (2) Length of recreation pool: 3,700 feet
- (3) Length of flood control pool: N/A

e. Storage (acre-feet)

- (1) Test flood surcharge (Net): 505 at El
84.4
- (2) Top of dam: 620 (which would be affected
by dam failure)
- (3) Flood control pool: N/A
- (4) Recreation pool: 185
- (5) Spillway crest: 210

f. Reservoir Surface (acres)

- *(1) Top dam: 85
- *(2) Test flood pool: 85
- (3) Flood control pool: N/A
- (4) Recreation pool: 85
- (5) Spillway crest: 85

g. Dam

- (1) Type: earthfill
- (2) Length: 250 feet
- (3) Height: 8 feet
- (4) Top width: 50 feet

*Based on the assumption that the surface area will not increase significantly with changes in reservoir elevation from 77.0 to 86.0.

PENTUCKET POND

Downstream of Mill Street, the Parker River flows through a gravel pit. The river becomes tidal about five miles downstream, and eventually drains into Plum Island Sound.

The spillway and the fish ladder can discharge an estimated 264 and 66 cfs respectively, with the water surface at El 81.8 which is the low point on the crest of the dam. During the test flood (one-half PMF), the peak discharge would be 2,510 cfs with the pond at El 84.4. The crest of the dam would be overtopped by about 2.6 feet. The spillway and fish ladder can discharge only 14 percent of the test flood before the dam is overtopped.

The maximum flood level at the dam is unknown. The Massachusetts Geodetic Survey reported a pond elevation of 80.4 feet during the March 1936 flood. Past inspection records do not indicate whether either the original or the present dam has ever been overtopped.

- c. Elevation (feet above Mean Sea Level (MSL)). A benchmark was established at El 77.0 on the crest of the spillway (see Figure B-1). This elevation was based upon the elevation shown on the plan of the proposed outlet dated 1963 by Charles H. Morse and Son. (see Figure B-4).

- (1) Top dam: 81.8 to 83.6
- (2) Test flood pool: 84.4
- (3) Design surcharge: unknown
- (4) Full flood control pool: Not Applicable (N/A)
- (5) Recreation pool: 76.6 (fish ladder)
- (6) Spillway crest (ungated): 77.0
- (7) Upstream portal invert diversion tunnel: N/A
- (8) Stream bed at centerline of dam: 74.2
- (9) Tailwater: 74.7

PENTUCKET POND

The present outlet, built in 1965, replaced a timber bulkhead and platform which originally had a slide gate but later was replaced with stop logs.

1. Normal Operating Procedure. There are no normal operating procedures at the dam.

1.3 Pertinent Data

- a. Drainage Area. Pentucket Pond has a drainage area of approximately 7.5 square miles (4,800 acres). A map of the drainage area is shown in Figure D-1. The area is largely undeveloped, wooded and swampy, except in the vicinity of Georgetown. The Parker River flows into Rock Pond which is just upstream and drains into Pentucket Pond. There also are several very small ponds within the drainage area. The area is mostly gently rolling with moderately steep slopes on the outlying hills. An abandoned railroad embankment extends in a northwest-southeast direction through the drainage area between Pentucket and Rock Ponds. A detail showing the upstream railroad embankment is shown on Figure B-2.
- b. Discharge. Pentucket Pond discharges over the ungated spillway and the fish ladder. The spillway is an ogee-type weir which is 6.5 feet long and at El 77.0. The fish ladder is a sharp crested weir 1.8 feet wide with its crest at El 76.6. Flashboards can be added to the spillway.

The discharge channel is about 15 feet wide with an invert at El 74.2. The channel continues through a 10-foot wide opening in an abandoned railroad embankment about 500 feet downstream of the dam. The channel is then split into two streams by a small earth dike, which is probably the old impoundment structure mentioned in some historical notes in Appendix B. These channels then continue north and pass through two separate culverts under Mill Street. The culverts have minimum dimensions (at the downstream end) of 11.5 feet wide by 5.75 feet high and 8.6 feet wide by 5.75 feet high.

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- c. Size Classification. Pentucket Pond Dam is classified in the "small" category since it has a maximum height of 8 feet and a storage capacity of 620 acre-feet which would be affected by failure of the dam. The maximum storage capacity is much greater since the level of Pentucket Pond, which was a deep natural pond, was raised when the dam was constructed. A large volume of the pond storage is below the toe of the dam embankment.
- d. Hazard Classification. Immediately downstream of the dam is a wooded swamp. An abandoned railroad embankment is located about 500 feet downstream. This embankment would slow and constrict a flood wave if the dam failed. However, there is the possibility of flood damage to homes on North Street. Also, a few lives could be lost if local residents, fishermen or children were in the downstream areas. For these reasons the dam at Pentucket Pond has been placed in the "significant" hazard category.
- e. Ownership. The dam is owned by the Town of Georgetown, Massachusetts (617-352-2711, Town Clerk's Office). Mr. Joseph A. Soucy, Chairman of the Board of Selectmen, granted permission to enter the property and inspect the dam.
- f. Operators. There are no known operators of this dam. Mr. Soucy indicated he visits the site three to four times a year.
- g. Purpose of Dam. It is reported that the pond was partially manmade and the dam's original purpose was to increase the pond's surface area for producing ice. The pond is presently being used for recreational purposes.
- h. Design and Construction History. There is no information available relative to the design and construction of the original dam, which was reportedly built in the 1800's. It is reported that the dam was built to increase the pond's surface area for producing ice.

PENTUCKET POND

Massachusetts (see Location Map and Figure D-1, Drainage Area Map). The coordinates of this location are latitude 42 deg. 43.8 min. north and longitude 70 deg. 59.5 min. west. The Parker River flows into Plum Island Sound.

b. Description of Dam and Appurtenances.

Pentucket Pond Outlet consists of an earthfill embankment and a concrete outlet which contains a spillway and fish ladder. The outlet is spanned by a roadway and pedestrian bridge for Pond Street.

The embankment has a maximum height of 8 feet. It consists of two sections; the right section extends about 90 feet south of the outlet and the left section extends about 160 feet north. The upstream slope is partially covered with riprap. The upstream face of the dam slopes at 2:1 (horizontal:vertical) and the downstream face of the left embankment slopes at 3:1. A house is located on the downstream face of the right embankment. The fill around the house slopes on the average at 5.5:1. The top of the dam is about 50 feet wide. Pond Street and the chain-link fence at both edges of the pavement are located on the top of the dam. The right and left abutments tie into natural ground. Houses are located on both abutments.

The outlet contains a spillway and a fish ladder. The spillway is an ungated, ogee-type concrete weir. The spillway crest is 6.5 feet long and is at El 77.0. Flashboards can be added to the crest of the spillway. The fish ladder is 1.8 feet wide with its crest at El 76.6. An 8-inch concrete training wall separates the spillway from the fish ladder. Larger concrete abutment walls carry the roadway deck. Flows approaching and exiting the outlet are guided by sloping concrete wing walls. At the spillway, the discharge channel is about 15 feet wide with an invert at El 74.2. The channel bottom beneath Pond Street is lined with stone. Downstream of Pond Street, the channel is a natural streambed comprised of sand and gravel.

PENTUCKET POND

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

PENTUCKET POND

SECTION 1

PROJECT INFORMATION

1.1 General

- a. Authority. Public Law 92-367, dated August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Metcalf & Eddy, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Contract No. DACW 33-79-C-0054, dated March 27, 1979, has been assigned by the Corps of Engineers for this work.
- b. Purpose:
 - (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
 - (2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.
 - (3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

- a. Location. The dam is located on the Parker River, in the Town of Georgetown, Essex County,

PENTUCKET POND

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

- a. General. Pentucket Pond has a tributary drainage area of 7.5 square miles (4,800 acres), with about 11 percent of the area in ponds and swamps. Rock Pond and Sperrys Pond are the only significant ponds located within the drainage area. The area is largely undeveloped and wooded except in the Georgetown area. The average basin slope was estimated at 0.8 percent.

Pentucket Pond Dam is an earthfill dam with a maximum height of 8 feet and a concrete outlet rebuilt in 1965. The spillway is an ungated, ogee-type weir, about 6.5 feet long with a crest at El 77.0. Pond levels are controlled by the spillway and the fish ladder. The crest of the fish ladder is at El 76.6. There is no low level or regulating outlet at this dam. However, the spillway crest can be elevated a maximum of one foot with the addition of stop logs.

- b. Design Data. There are no hydraulic or hydrologic computations available for the design of this dam. However, there were a few notes available on the redesign of the outlet. The available data were reviewed.
- c. Experience Data. The Massachusetts Geodetic Survey reported a pond level at El 80.4 during the March 1936 storm. There is no other data available on past flood levels.
- d. Visual Observations. The outlet is relatively new, however, some of the concrete works, especially that of the roadway deck fascia, is in poor condition. The ungated, "ogee-type" spillway appears to be in good condition. The outlet also contains a fishway constructed of timber lattice work. Both the spillway and the fishway crests can be elevated a maximum of one foot with the addition of stop logs.

PENTUCKET POND

There is no approach channel, and the entrance to the outlet is clear. The outlet channel extends under the roadway and discharges east of Pond Street.

There is no regulating or low level outlet at this dam.

- e. Test Flood Analysis. Pentucket Pond Outlet has been classified as a "small" size dam of "significant" hazard potential. According to Corps of Engineers' guidelines, a test flood within the range of the 100-year to the one-half probable maximum flood (PMF) should be used for evaluating the capacity of the spillway and dam. For this investigation, the one-half PMF was used.

The PMF rate was determined to be 800 cfs per square mile. This calculation is based on the average slope of the drainage area of 0.8 percent, the pond-plus-swamp area to drainage area ratio of 11 percent, and the U.S. Army Corps of Engineers' guide curves for Maximum Probable Flood Peak Flow Rates (dated December 1977). Applying the one-half PMF to the 7.5 square mile drainage area results in a calculated peak flood flow of 3,000 cfs as the inflow test flood. By adjusting the inflow test flood for surcharge storage, the maximum discharge rate was established as 2,510 cfs (335 cfs per square mile), with a water surface at El 84.4.

Hydraulic analyses indicate that the spillway and the fish ladder can discharge a combined flow of 330 cfs when the water surface is at El 81.8, which is the low point on the top of the dam. The spillway alone can discharge 264 cfs with the water at the same elevation. The combined discharge is only 14 percent of the outflow test flood.

During the test flood, the dam would be submerged under a maximum head of 2.6 feet. The test flood pool will also overtop a section of Pond Street at least 250 feet long beginning about 150 feet north of the dam. Peak discharge over the top of the dam would be 10.7

PENTUCKET POND

cfs per foot of width. At critical flow, the head would be 1.53 feet with a velocity of 7.0 feet per second, assuming no downstream restrictions on the discharge. However, there is a railroad embankment about 500 feet downstream of the dam which would cause water to back up between the dam and the railroad. The top of the embankment is at about El 82, and water discharges through a 9-foot high by 10-foot wide opening in the embankment. During the test flood, the opening would discharge 810 cfs, and the embankment would be overtopped by about 2 feet.

- f. Dam Failure Analysis. Assuming a failure of the dam with the water surface at El 81.8, which is the low point on the top of the dam, the peak discharge would be about 2,400 cfs. Discharge from failure of the dam would produce an initial downstream water depth of about 4 feet above the toe of the dam (tailwater El 78.2). However, the discharge would be impounded by the downstream railroad embankment, causing the tailwater to rise to the pond level at El 81.8 (7.6 feet above the toe of the dam). With the entire dam removed and the pond at El 81.8, the constriction of the railroad embankment would limit outflow to about 810 cfs. Beyond the railroad embankment the discharge channel is split into two streams which flow through two culverts under Mill Street. These culverts can discharge the peak flow from failure of the dam without overtopping Mill Street. However, the water would back up and cause flooding in the residential area on North Street, south and east of the dam. It would take about 18.5 hours to drain the pond down to El 74.2 at the toe of the dam embankment, with the discharge controlled by the opening through the downstream railroad embankment.

PENTUCKET POND

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

- a. Visual Observations. The evaluation of the structural stability of Pentucket Pond Dam is based on the review of the available drawings and notes, and the visual inspection conducted on April 16, 1979. A detailed discussion of the visual inspection is given in Section 3, Visual Inspection. Based on this inspection, the dam is in fair condition. However, some erosion of the embankment adjacent the outlet, if allowed to continue, will present a hazard to the stability of the dam.
- b. Design and Construction Data. There are no plans, specifications or computations available on the design or construction of the original dam.

Drawings of the rebuilding of the outlet are included in Appendix B.

Preliminary notes by Charles Morse and Son Engineering Company on the stability of the rebuilt outlet were reviewed.

Information does not appear to exist on the type, shear strength, and permeability of the soil and/or rock materials of the embankment.

- c. Operating Records. There is no instrumentation of any type in Pentucket Pond Dam, and no instrumentation was ever reportedly installed. The performance of this dam under prior loading can only be inferred from physical evidence at the site.
- d. Post-Construction Changes. There are no as-built drawings available for Pentucket Pond Dam. Based on visual evidence, and field measurements, the outlet appears to be built essentially as shown on the Morse plans. However, the fish ladder has been altered since the 1964 drawing.

PAWTUCKET POND

- e. Seismic Stability. The dam is located in Seismic Zone No. 3. Performance of the dam embankment during an earthquake is a function of the earthquake itself and the dam's foundation and embankment soils. There is no information available on the soils in or below the embankment. Therefore, a seismic evaluation cannot be performed at this time. In any case, due to the low head configuration of the dam, location, and downstream topography a seismic stability analysis is not considered warranted.

PENTUCKET POND

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessments

- a. Condition. Based on visual inspection of the site, the limited design data, past inspection records and the lack of maintenance procedures, there are several deficiencies which must be corrected to assure the continued performance of this dam. Generally, the dam is considered in "fair" condition.

Signs of distress at the site are: sloughing and erosion of embankment slopes adjacent to the outlet structure and at the toe of the downstream slope, failure of the riprap on the upstream slope of dam and the deterioration of the concrete in the outlet structure. In addition, other maintenance functions such as control of vegetation, pavement repair, and removal of debris from the downstream channel should be undertaken.

Hydraulic analyses indicate that the spillway and fish ladder can discharge a flow of 330 cfs with the water surface at El 81.8 which is the low point on the top of the dam. An outflow test flood of 2,510 cfs (one-half PMF) will overtop the dam by a maximum of 2.6 feet. The spillway and the fish ladder can discharge only 14 percent of the test flood without overtopping the dam.

- b. Adequacy. The lack of detailed design and construction data did not allow for a definitive review. Therefore, the evaluation of the adequacy of this dam is based primarily on the visual inspection, past performance and engineering judgment.
- c. Urgency. The recommendations and remedial measures outlined below should be implemented by the Owner within one year after receipt of this Phase I Inspection Report.

PENTUCKET POND

- d. Need for Additional Investigation. Additional investigations to further assess the adequacy of the dam are outlined below in Section 7.2, Recommendations.

7.2 Recommendations. In view of the concerns over the continued performance of the dam, it is recommended that the Owner employ the services of a qualified engineering consultant to conduct a more detailed hydraulic and hydrologic investigation. The purpose would be to design a low-level outlet and to evaluate increasing the discharge capacity of the spillway to prevent overtopping of the dam. The Owner should implement the results of this investigation.

7.3 Remedial Measures

- a. Operating and Maintenance Procedures. It is recommended that the Owner accomplish the following:
- (1) repair deteriorated concrete at the outlet structure.
 - (2) replace riprap on the upstream slope of the dam and backfill the eroded areas in the embankment adjacent to the outlet.
 - (3) selectively clear trees, roots and brush on the dam and within 10 feet of the downstream toe. All excavations for stumps and roots should be backfilled with selected material.
 - (4) clear the accumulated debris from the downstream channel.
 - (5) repair and maintain the pavement on Pond Street on top of the dam.
 - (6) implement a systematic program of maintenance inspections. As a minimum, the inspection program should consist of a monthly inspection of the dam and appurtenances. It is essential that a

PENTUCKET POND

department in the Town be assigned permanent responsibility for maintaining the dam. All repairs and maintenance should be undertaken in accordance with all applicable State regulations.

- (7) conduct technical inspections of this dam on an annual basis.
- (8) institute a definite plan for surveillance of the embankment during and after periods of unusually heavy runoff and a plan for notifying nearby residents in case of an emergency at the project.

7.4 Alternatives. There are no recommended alternatives.

PENTUCKET POND

APPENDIX A
PERIODIC INSPECTION CHECKLIST

PENTUCKET POND

PERIODIC INSPECTION

PARTY ORGANIZATION

PROJECT PENTUCKET POND DAM

DATE Apr. 16, 1979

TIME 0800

WEATHER Cloudy & Drizzly

W.S. ELEV. 77.9 U.S. 74.8 D.N.S.

PARTY:

- | | |
|-----------------------|-----------------------|
| 1. <u>W. Checchi</u> | 6. <u>J. Risitano</u> |
| 2. <u>F. Sviokla</u> | 7. _____ |
| 3. <u>R. Weber</u> | 8. _____ |
| 4. <u>L. Branagan</u> | 9. _____ |
| 5. <u>S. Nagel</u> | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
Dam	Ristano/Weber	
1. _____		
2. <u>Spillway</u>	<u>Ristano/Branagan</u>	
3. _____		
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECK LIST

PROJECT PENTUCKET POND DAM DATE Apr. 16, 1979
 PROJECT FEATURE Dam NAME J. Risitano
 DISCIPLINE Geotechnical NAME _____

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	Note: trees & brush on upstream & downstream slopes. Varies from 81.9 to 83.6
Crest Elevation	
Current Pool Elevation	77.9
Maximum Impoundment to Date	UNKNOWN
Surface Cracks	Asphalt roadway on crest - cracks in road longitudinal & "alligator" type - no cracks in fill - ave. 3/4" wide
Pavement Condition	See above - poor
Movement or Settlement of Crest	Some - pavement poor
Lateral Movement	None
Vertical Alignment	Dips down at dam (vertical curve)
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Rt. abut. - good; house w/ basement & driveway fill. Lt. abut. another house also good condition. 8" tile drainage pipe emptying into downstream channel at rt. abutment. Left abut. another house also good condition.
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	Heavy foot traffic especially at dam both upstream & downstream slopes
Sloughing or Erosion of Slopes or Abutments	Both downstream & upstream sides of bridge also edge of swamp
Rock Slope Protection - Riprap Failures	*Riprap which appears to have failed is located at top of upstream slope for 200' along the embankment. At south abutment property line & lake shore is a 8" conc. block wall.
Unusual Movement or Cracking at or near Toes	None visible (swamp)
Unusual Embankment or Downstream Seepage	Ponded surface water downstream of entire length of embankment may be swamp
Piping or Boils	None visible
Foundation Drainage Features	None visible
Toe Drains	None visible
Instrumentation System	None visible

PERIODIC INSPECTION CHECK LIST

PROJECT PENTUCKET POND DAM DATE Apr. 16, 1979
 PROJECT FEATURE Spillway NAME J. Risitano
 DISCIPLINE Geotechnical NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Gravel bottom
b. Weir and Training Walls	Ogee-type weir and gravity type (sloping) walls
General Condition of Concrete	Fair - some cracking on Training walls
Rust or Staining	None visible
Spalling	Heavy on cap and corners where water moves over spillway. Minor spalling-deteriorated edges.
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None
Drain Holes	None
c. Discharge Channel	
General Condition	Fair (no obstructions)
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Several trees overhanging
Floor of Channel	Rock bottom
Other Obstructions	Boat pier washed off to left side

PERIODIC INSPECTION CHECK LIST

PROJECT PENTUCKET POND DAM DATE Apr. 16, 1979
 PROJECT FEATURE Outlet NAME J. Risitano
 DISCIPLINE Geotechnical NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u>	
General Condition of Concrete	Poor
Rust or Staining on Concrete	At exposed rebar only (four bars)
Spalling	Considerable at west & east fascia caps of bridge deck exposing rusted rebar
Erosion or Cavitation	Heavy on cap & left pier at the water level and above
Cracking	Mostly in eroded area surface cracking
Alignment of Monoliths	Good at fish ladder sidewall
Alignment of Joints	Not applicable
Numbering of Monoliths	2 on fish ladder wall only may have been due to change of design

Additional Notes:

1. Bridge deck comprised of 2' wide slabs of granite rough bottom. Concrete cap has a fascia at each end. Four 3/4" rebar exposed asphalt coating on underside badly deteriorated, efflorescence visible. Mortared stone side walls in fair condition. There are some spots where mortar missing, channel bottom stone lined.
2. Fish Ladder - 2x6 and 1x4 timber construction may have been a different type of construction of fish ladder at one time. Slots in smaller training wall and spillway training wall indicate this. One pair stop log slots on both training walls and fish ladder training wall.
3. Footing of downstream wing walls visible at channel bottom.
4. Discharge channel splits into two channels 50 yards downstream.
5. Water level guage installed by local Conservation Commission, water level 79.2 at creek between Rock & Pentucket Ponds at Rte. 97 (Main Street).

APPENDIX B

PLANS OF DAM AND PREVIOUS
INSPECTION REPORTS

	<u>Page</u>
Figure B-1. Plan of Dam	B-1
Figure B-2. Additional Details	B-2
Figure B-3. Supplemental Plan of Fishway dated 1964	B-3
Figure B-4. General Plan of Pentucket Pond Outlet dated 1963	B-4
Figures B-3 and B-4 Design Drawings of Rebuilt Outlet by Charles H. Morse and Son Engineers, Haverhill, Massachusetts (Plans from Morse File)	
Plan of Georgetown Culverts on Mill Street dated 1943	B-5
Inspection Report by Massachusetts Department of Public Works, July 1, 1972	B-6
Previous Inspection Reports (Partial Listing) by Essex County Personnel	B-7
Georgetown Town Reports dated 1949, 1950, 1963, and 1964	B-15
Correspondence and Historical Data	B-19

PENTUCKET POND

the old timbers in front of spillway which are not used now which could be removed.

Note of July 23. Trash rack in place. J.H. No reason for a rack here. Better to let material go through. Use log boom if necessary.

1955, Nov. 22, E.H. Page, Insp. Elev. of water: 2'-1" below top timber x 8) There is a pipe trash rack here which cuts down the flow by 1/2 itself but now it is filled with leaves and holding back about 2 ft. of water.

1956, April 24, E.H. Page & J.O. Harmaala, Insp. The screens are filled with leaves forming a tight dam. The water is flowing over and around the wing walls. These screens should be kept clean so as to lower the pond elevation.

1955 Report to Co. Comm. Pentucket Pond outlet at Pond Street. The timber work is in very poor repair as last reported. A trash rack of one-made design has been placed here. This rack cuts the flow of water by half, but now it is full of leaves and is holding back two feet of water. This rack should be redesigned.

1957, Dec. 3, E.H. Page, Insp. Elev. of water: 3'-2" below top of 4" x 8" timber over rack. Obstructions: Some debris in culvert under road which should be removed. Condition of dam: Fair. Rack is filled with leaves and holding back about 8" of water.

1957 Report to Co. Comm. Pentucket Pond outlet at Pond Street. This structure is about the same as last reported. Leaves still clog the screen and hold back quite a lot of water.

1959, Sept. 23, E.H. Page, Insp. Elev. of water: About 12" of water running through a 12" wide weir. Height of flashboards: 10". The timber structure has become quite rotten. The kids have dammed up the water under the culvert with rocks. This is just below the outlet structure. It holds back about 18" of water. This cuts down the capacity of the culvert considerably. The usable culvert opening now is about 5' by 8.5'.

1959 Report to Co. Comm. Pentucket Pond outlet at Pond Street. The timber structure is in a very rotted condition. The kids have dammed up the water under the culvert with rocks. This is just below the outlet structure. It holds back about eighteen (18) inches of water. This cuts down the capacity of the culvert considerably. The usable culvert opening now is about 2.5' by 8.5'.

1961 Dec. 1, E.H.P. & P.D.K. Insp. Structure underneath culvert has been removed. Leaves and debris are holding back quite a bit of water. Water running around both sides of screen.

1961 Report to Co. Comm. Pentucket Pond outlet at Pond Street. No debris in the culvert has been removed. Leaves and other debris in the screen are holding back quite a bit of water. Water is running around both sides of the screen. This should be kept free of debris.

1963 Same as last report.

1963 Report to Co. Comm. Pentucket Pond outlet at Pond Street.

PENTUCKET POND
OUTLET

The debris in the culvert has been removed. Leaves and other debris in the screen are holding back quite a bit of water. Water is running around both sides of the screen. This should be kept free of debris. In 1963 plans were approved for repairs to this dam, but they have not been started yet.

1965 June 14, 1966. P.D.K. Insp. This dam has been replaced with a new concrete spillway, wingwalls and fishway. Charles Morse & Sons, Bradford, was the consultant.

1965 Report to Co. Comm. The dam has been replaced with a concrete spillway with concrete wing walls and fishway.

1967 Jan. 25, 1968. P.D.K. Insp. Good condition.

1967 Report to Co. Comm. Safe and in reasonably good condition.

PENTUCKET POND
OUTLET

L.E. WILKINSON

7/1/71

3

ON PENTUCKET POND. BEGIN ON ROUTE 97 IN GEORGETOWN SQUARE. - TAKE NORTH ST. NORTHEASTERLY 0.20 MI. TO POND ST. TAKE POND ST. NORTHERLY 0.35 MI. (DAM IS ROADWAY) - SPILLWAY IS WEST EDGE OF POND ST. AT THIS POINT.

TOWN OF GEORGETOWN

PLEASURE POND.

EARTH WITH RIPRAP FORMED BY POND ST.

ROADWAY. SPILLWAY, CONCRETE, SLUICING THROUGH CONC. BOX CULV.

8.0 FT. \pm 400. \pm FT.

50.0 FT. (H.W.)

50.0 \pm ACRES8.0 \pm

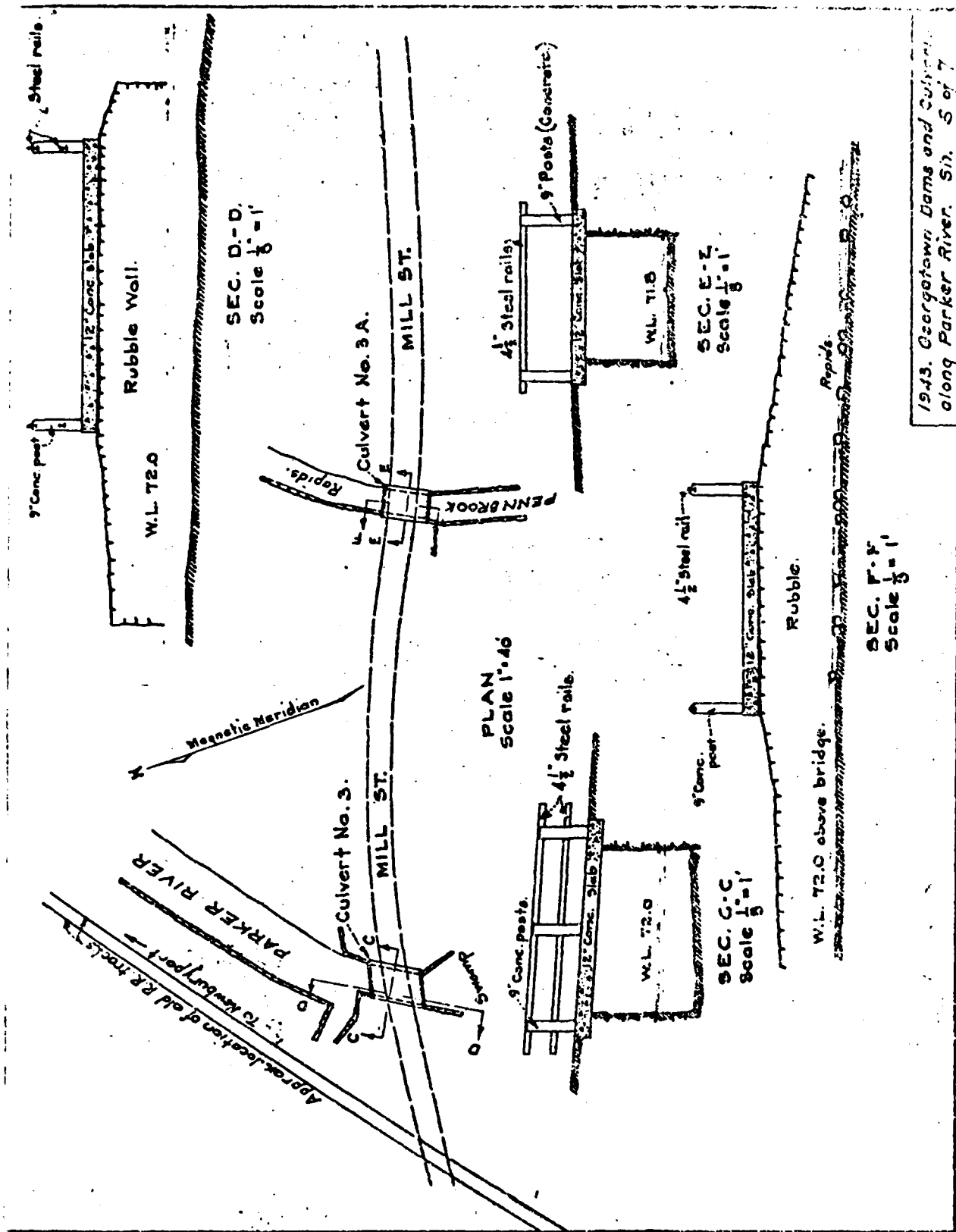
CONCRETE SPILLWAY, CULVERT AND

FISH LADDER IN EXCELLENT CONDITION. WATER FLOWING 2" DEEP
 SPILLWAY TO-DAY. NO FLASH BOARDS IN PLACE. OUTLET
 FREE OF DEBRIS

THIS DAM SAFE AND IN VERY GOOD

CONDITION

PENTUCKET POND
OUTLET



1943. Georgetown Dams and Culverts.
along Parker River. Sh. 5 of 7

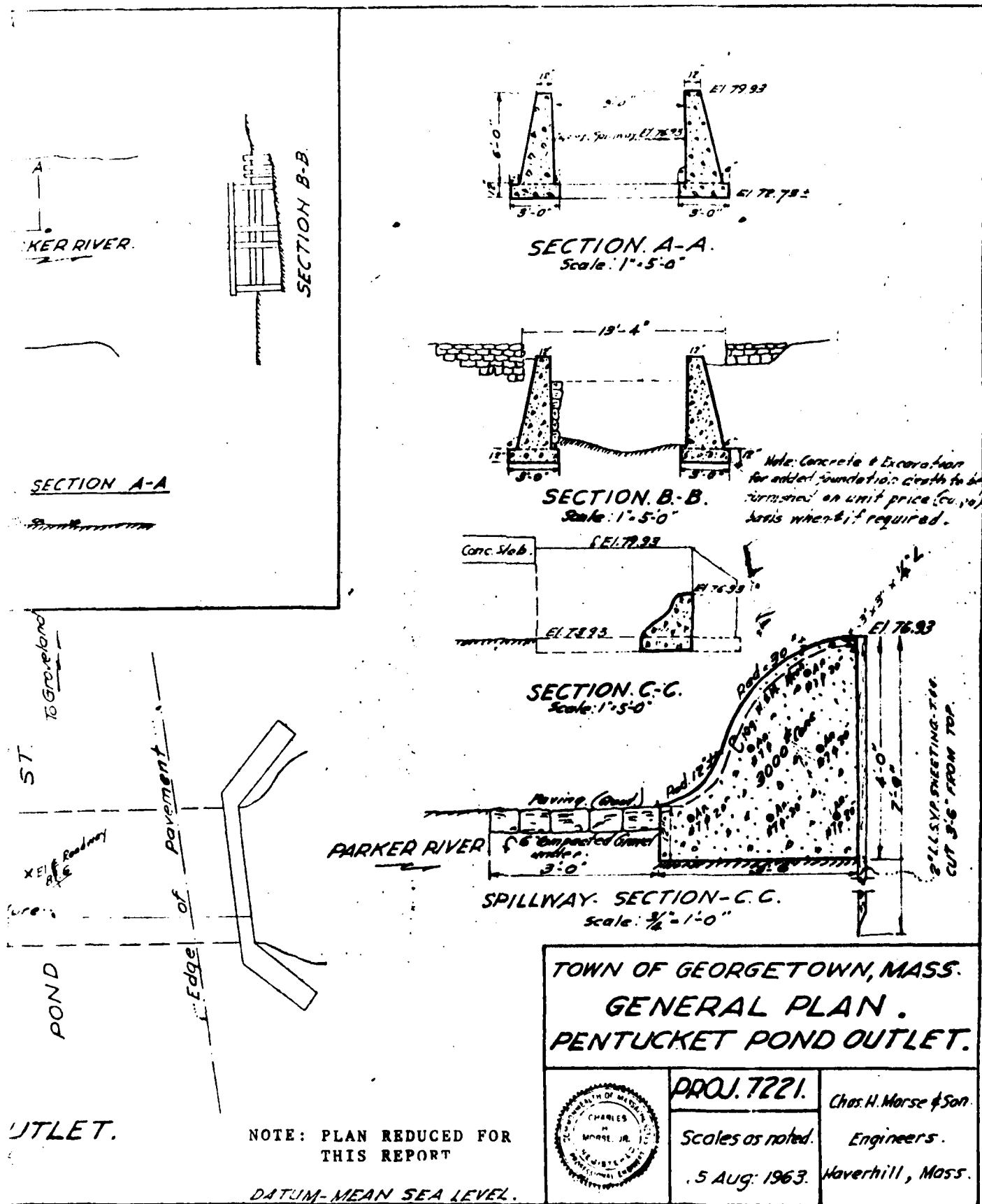
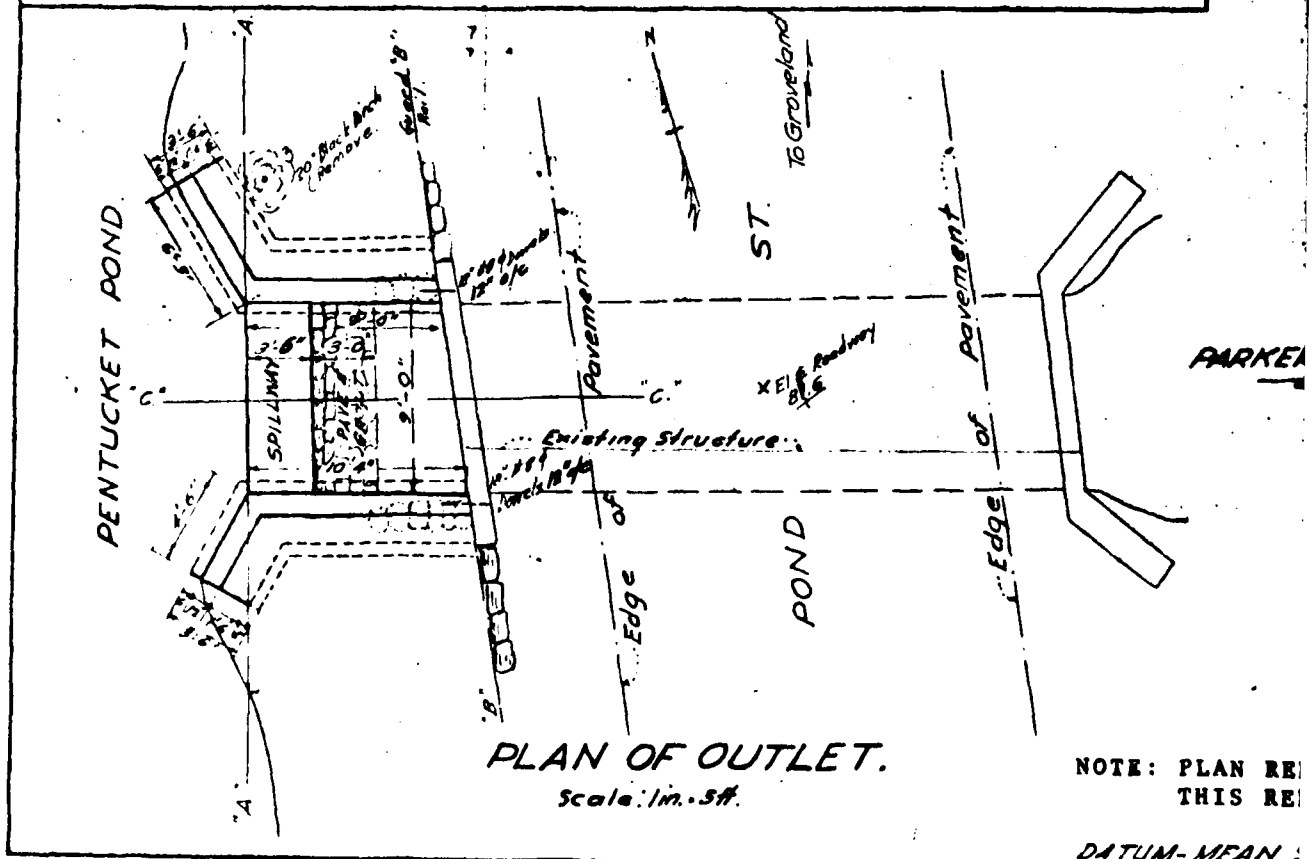
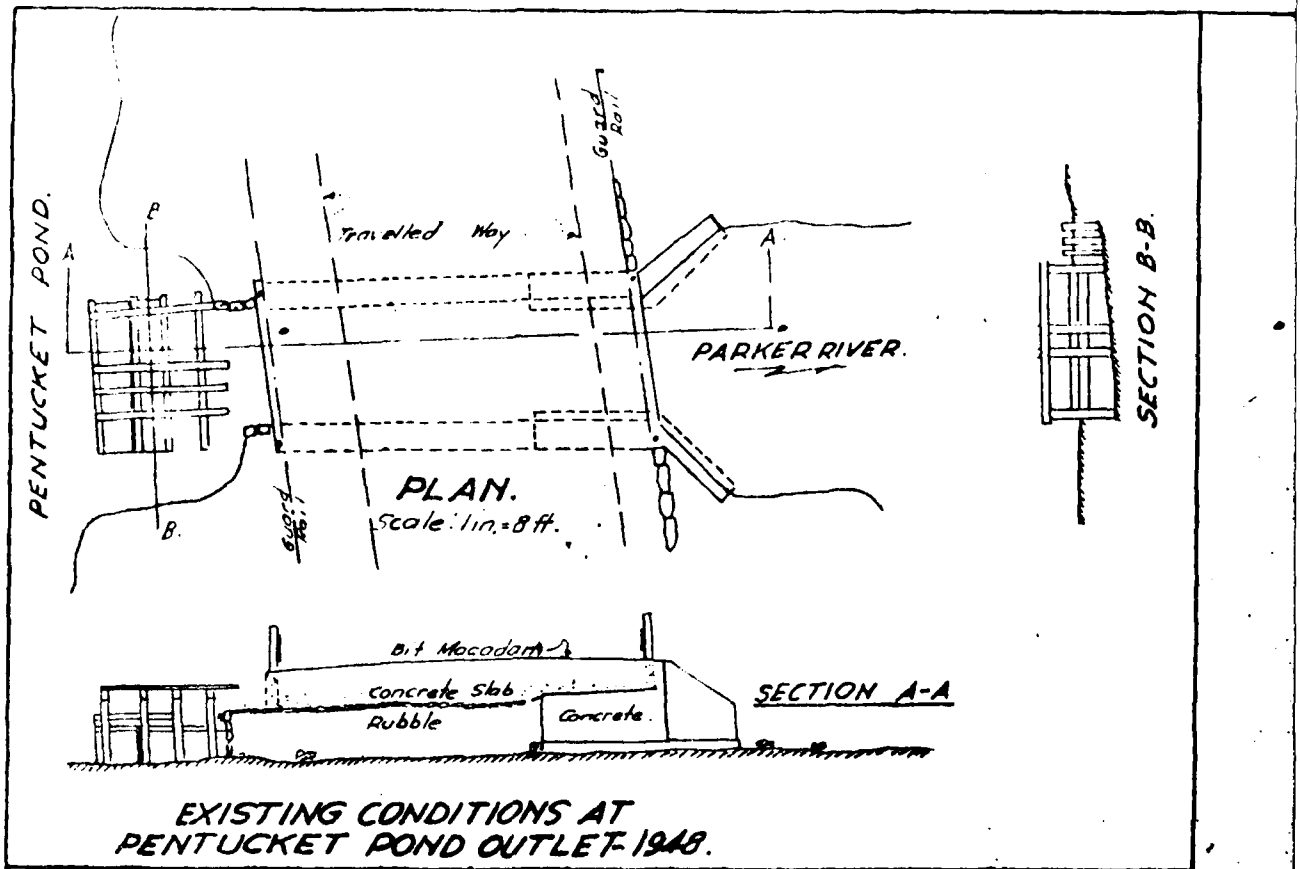
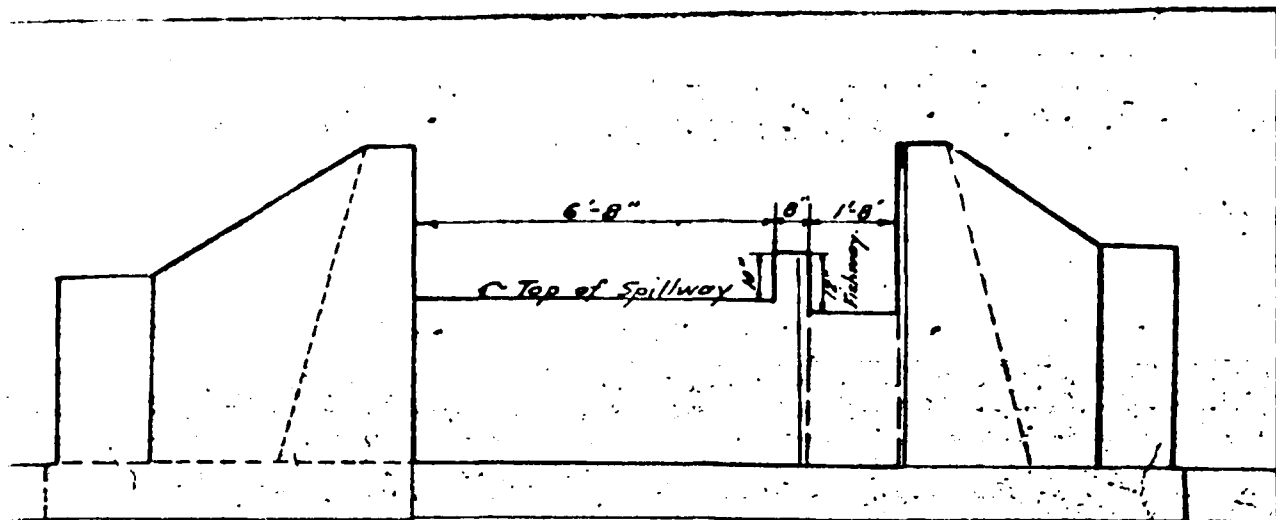


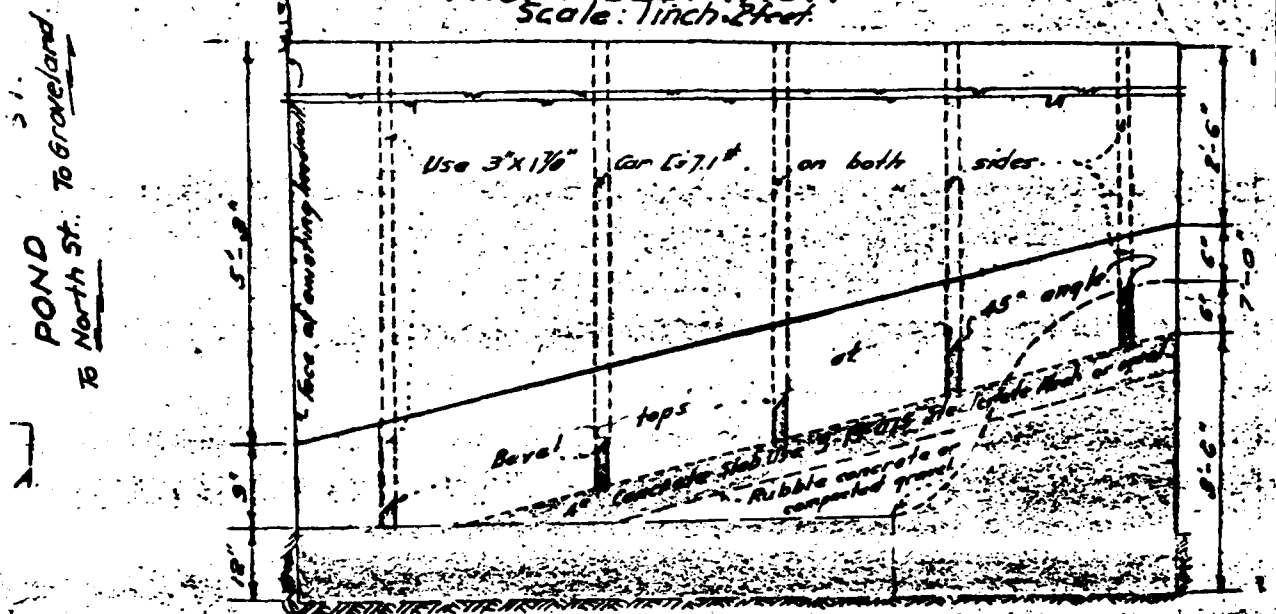
FIGURE B-4

2 of 2

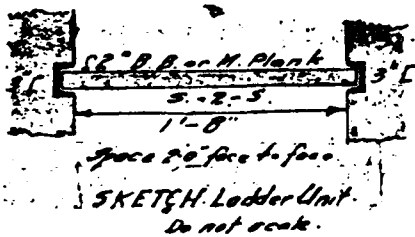




FRONT ELEVATION.
Scale: 1 inch = 2 feet.



SECTION A-A.
Scale: 1 inch = 1 foot.



NOTE: PLAN REDUCED FOR THIS REPORT

TOWN OF GEORGETOWN, MASS.
PENTUCKET POND OUTLET.
SUPPLEMENTAL PLAN SHOWING
PROPOSED FISHWAY.
BASIC DATA SHOWN ON PLAN NO. 7221-H

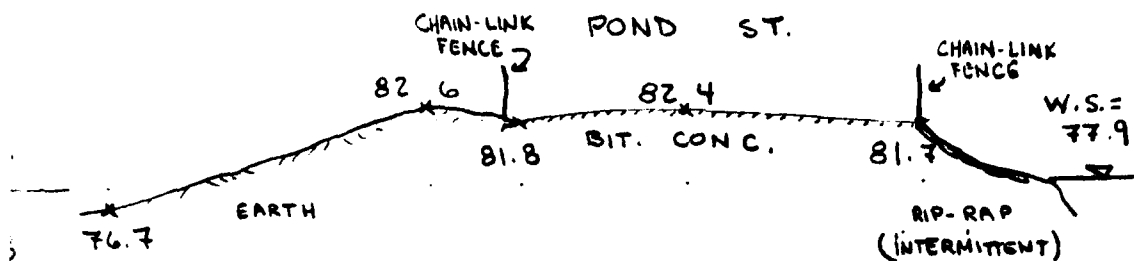


PROJ. 7221.
PLAN-2.
Scales as noted.
11 June 1964.

Chas. H. Morse & Son,
Engineers
100 Salem St.
Northwell, Mass.

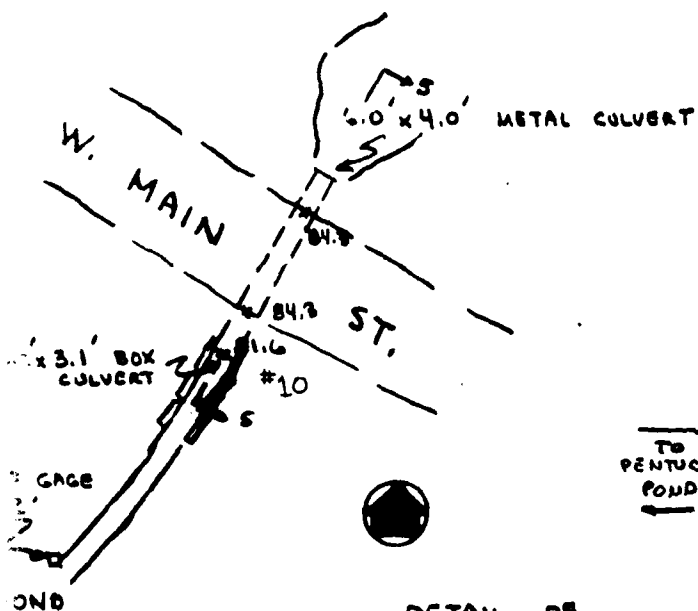
FIGURE B-3

24/2

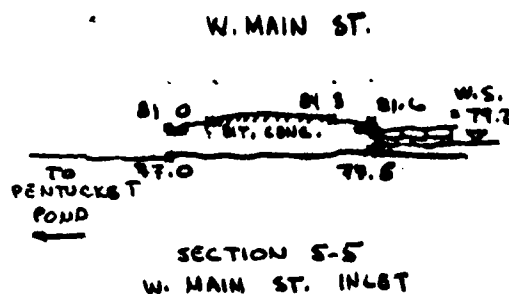


SECTION 3-3
TYPICAL SECTION THROUGH
DAM

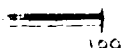
30



DETAIL OF
WEST MAIN STREET
INLET TO
PENTUCKET POND



SCALE



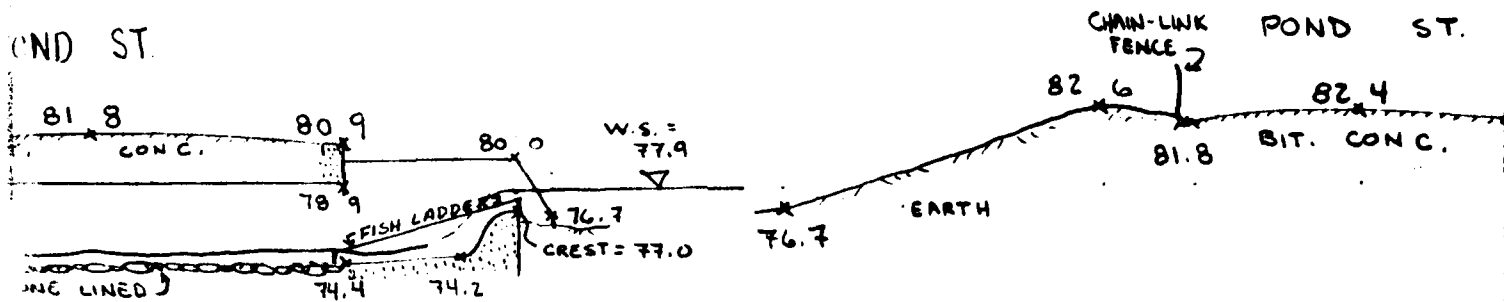
DATE
SURVEY OF APRIL 16, 1979

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
PENTUCKET POND OUTLET
FIGURE D-2 ADDITIONAL DETAILS

TRIBUTARY: PAMUN RIVER MASSACHUSETTS
SCALE: AS SHOWN DATE: NOV. 1979

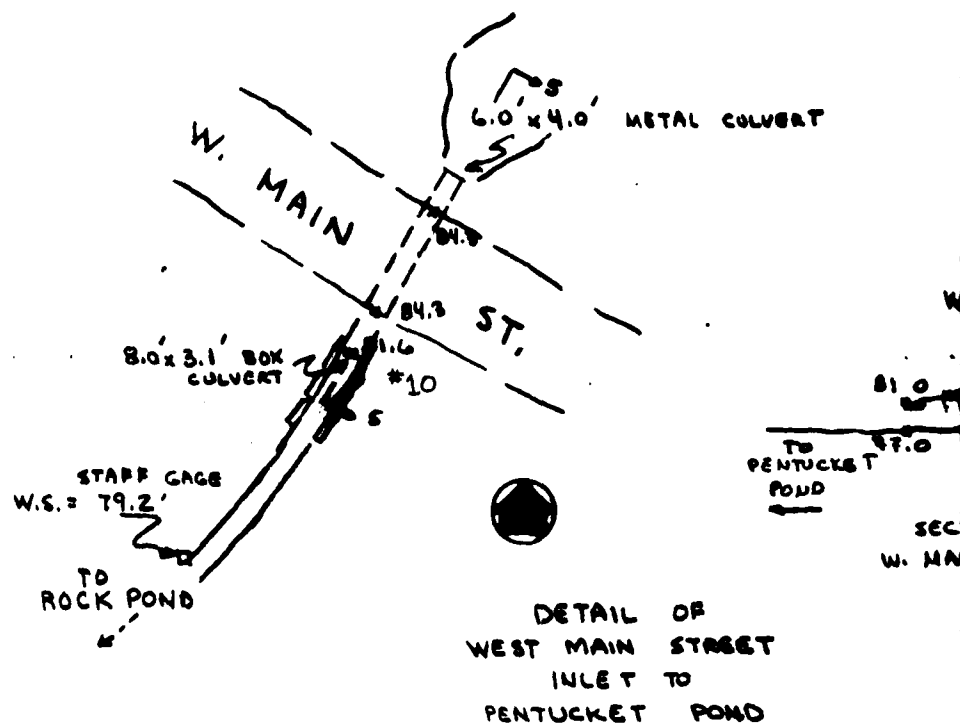
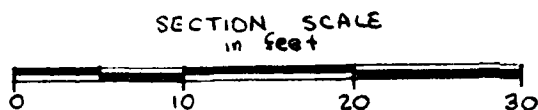
Reproduced from
best available copy.

3 of 3



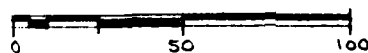
SECTION 2-2
SPILLWAY

SECTION 3-3
TYPICAL SECTION THROUGH
DAM



DETAIL OF
WEST MAIN STREET
INLET TO
PENTUCKET POND

DETAIL SCALE
in feet

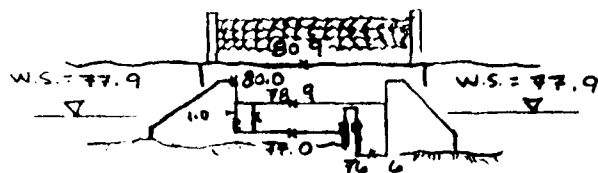


NOTES:

1. DETAIL ELEVATIONS ARE APPROXIMATE
2. INFORMATION BASED ON FIELD SURVEY OF APRIL 16, 1979
3. DIRECTIONAL LOCATION AND DIRECTION OF VIEWER PHOTOGRAPHS

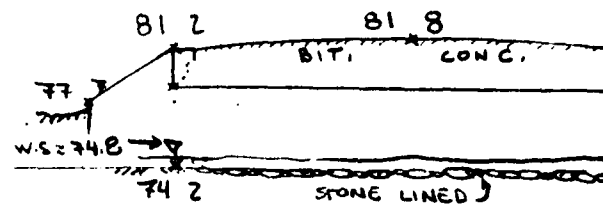
NATIONAL PROGRAM OF
PENTUCKET
FIGURE 8-2
TOWN OF PENTUCKET
SCALE: AS SHOWN

POND STREET

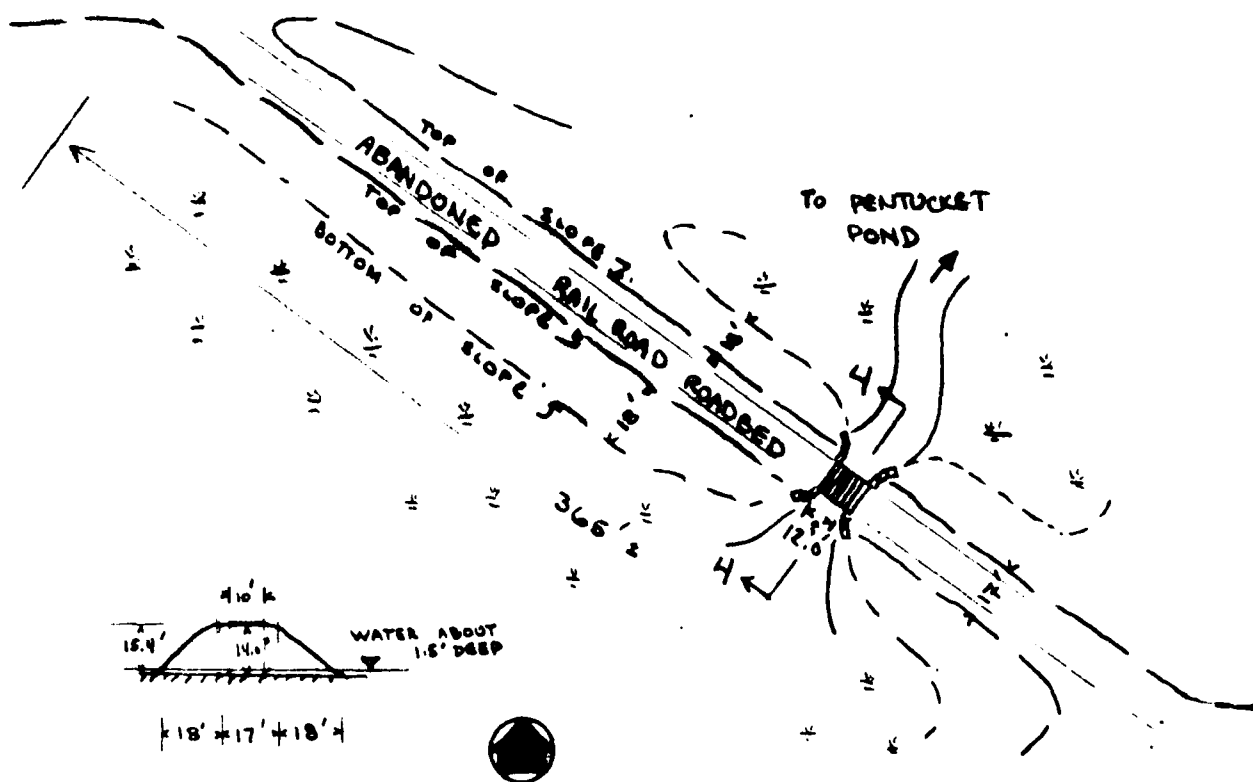


SECTION 1-1
ELEVATION VIEW OF
OUTLET (UPSTREAM)

POND ST.



SECTION 2-2
SPILLWAY



SECTION 4-4
TYPICAL SECTION
ABANDONED R.R. ROADBED


DETAIL OF
ABANDONED UPSTREAM
RAILROAD ROADBED

METCALF & EDDY, INC.

- NOTES
1. DETAIL
 2. INFORM

SURFACE LOG - 779



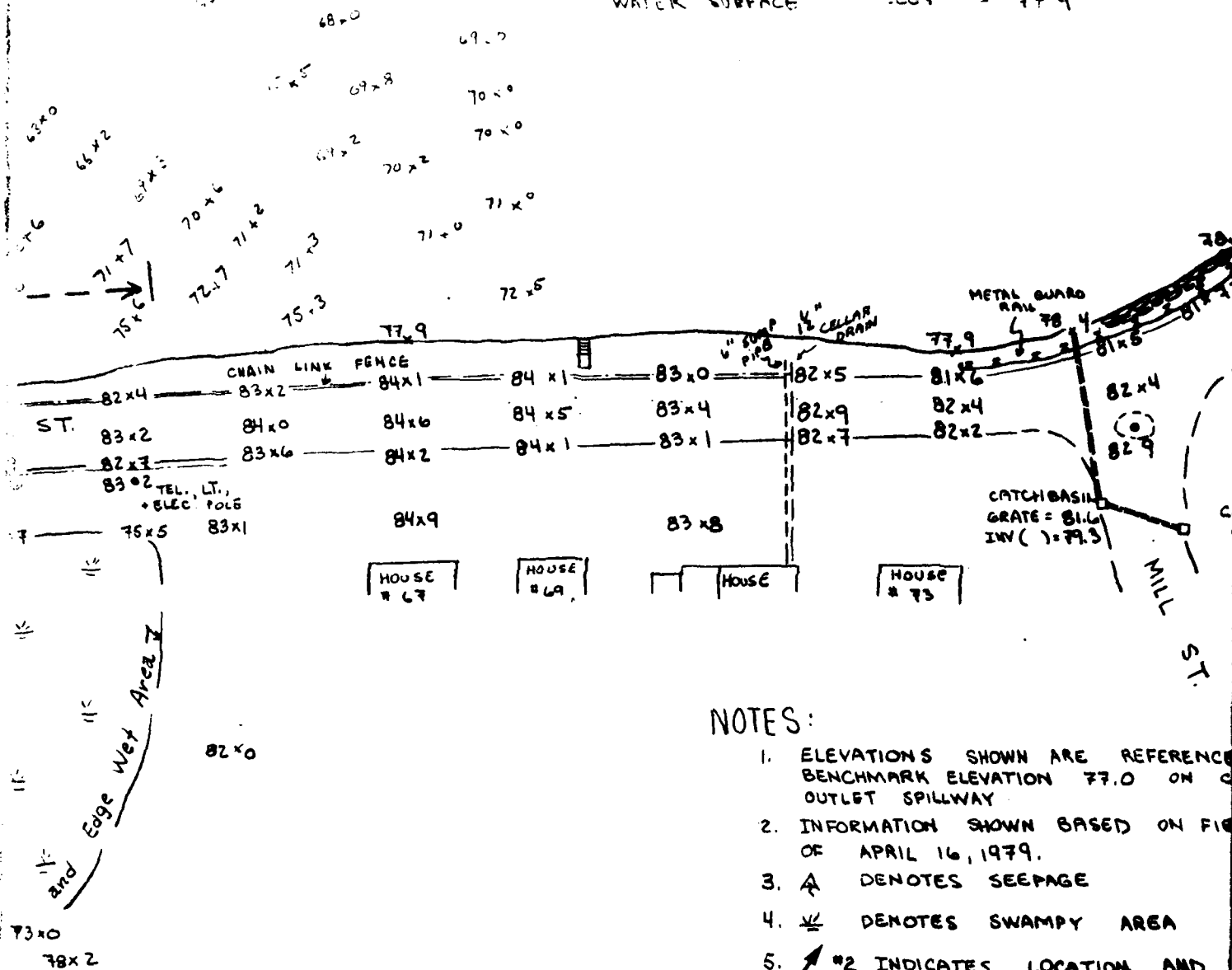
1. ELEVATIONS SHOWN ARE REFERENCED TO ASSUMED BENCHMARK ELEVATION 77.0 ON CREST OF OUTLET SPILLWAY
2. INFORMATION SHOWN BASED ON FIELD SURVEY OF APRIL 16, 1979.
3. A DENOTES SEEPAGE
4. \neq DENOTES SWAMPY AREA
5.  #2 INDICATES LOCATION AND DIRECTION OF VIEW FOR PHOTOGRAPHS
6. NUMBERS IN PENTUCKET POND PROPER DERIVED FROM PLAN OF SOUNDINGS JANUARY 1932 DONE BY MASS. DEPT. OF PUBLIC WORKS.

343

Reproduced from
best available copy.

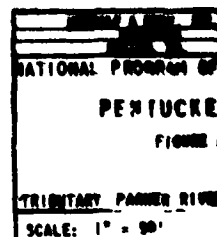
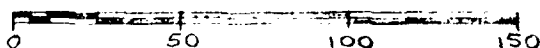
PENTUCKET POND

WATER SURFACE ELEV. = 77.9

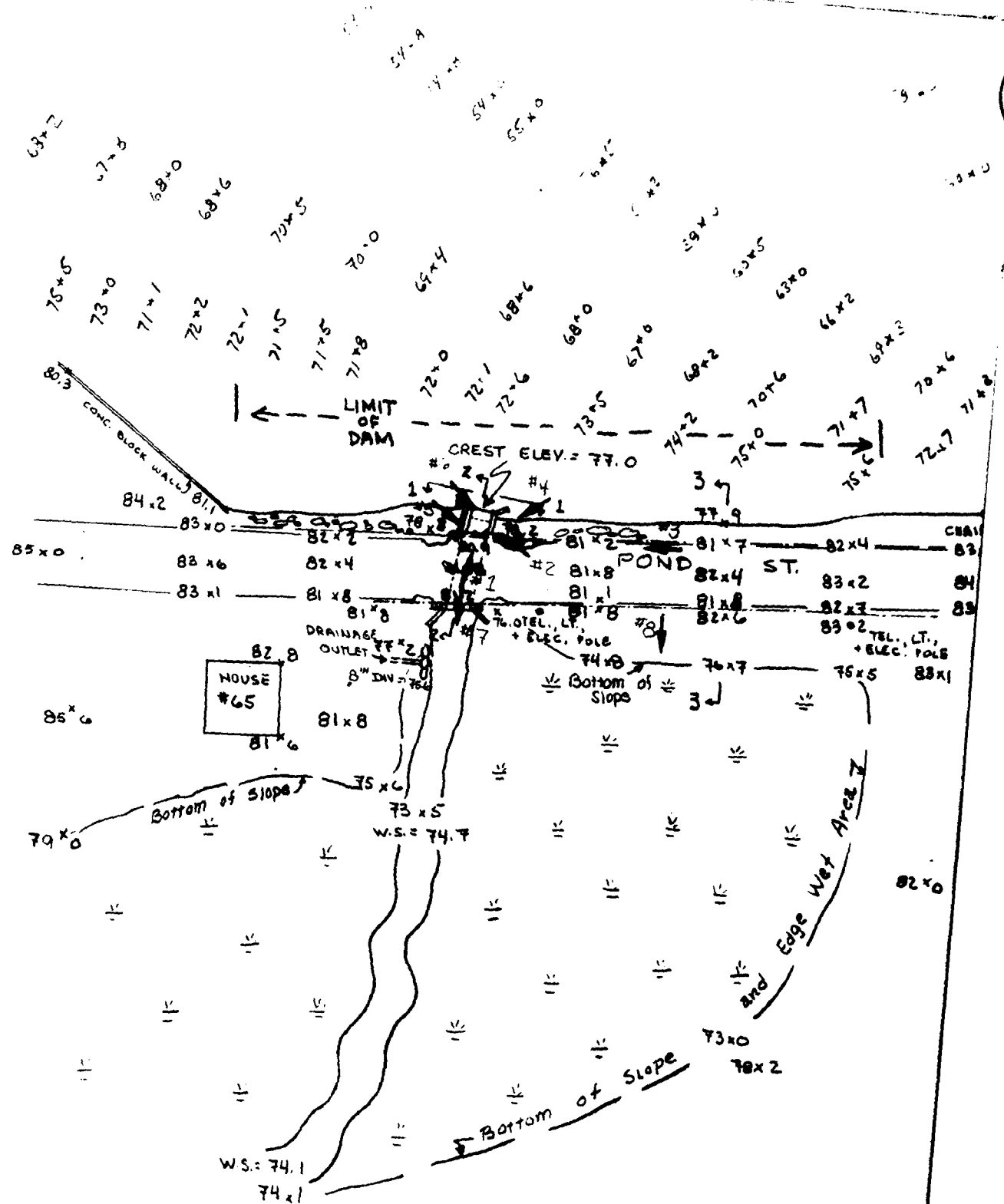


NOTES:

1. ELEVATIONS SHOWN ARE REFERENCE BENCHMARK ELEVATION 77.0 ON C OUTLET SPILLWAY
2. INFORMATION SHOWN BASED ON FIELD OF APRIL 16, 1979.
3. A DENOTES SEEPAGE
4. S DENOTES SWAMPY AREA
5. #2 INDICATES LOCATION AND VIEW FOR PHOTOGRAPHS
6. NUMBERS IN PENTUCKET POND PROPER PLAN OF SOUNDINGS JANUARY 1932 MASS. DEPT. OF PUBLIC WORKS.

PLAN SCALE
in feet


2 of 3



82x1
METCALF & EDDY, INC.

Georgetown D. 1

1947 Report to Co. Comm. The dam at Pentucket Pond is formed by the roadway (Pond Street) which is in good condition except at the outlet at the culvert there is a timber bulkhead and spillway which formerly had a gate that could be operated by a lever to control the flow and keep the pond at a certain elevation, and proved very satisfactory when under the control of the Byfield Snuff Company.

In the past several years, the Byfield Snuff Company has not had any interest in this dam and does not control it now. Consequently, without any supervision the conditions have been getting worse, and now the timber work has deteriorated and the wing walls of the culvert next the timber work are in very poor condition and should be repaired and also backed up with gravel fill and riprap to protect the embankment around the culvert.

If the pond is to be maintained at its former level, a good spillway of sufficient capacity and with proper controls should be built as a protection to the roadway and culvert. If this is not done, the old timber should be removed and the pond drawn down so that the culvert will not become blocked with debris and cause the water to overflow the road.

1949 Sept. 19, S.W.Woodbury, Insp. Went to dam alone. The masonry wing walls have been built up and cemented. Some gravel has been placed back of the wing walls so that the water is held back here. A trash rack has been placed in front of the spillway. Water level today: 3.8' below the top of the 6 x 8 timber. Condition of the dam: Better than when last inspected except the timber work which has not been repaired.

1949 Report to Co. Comm. The dam at Pentucket Pond, formed by the roadway (Pond Street), is in better condition than when last inspected as the masonry wing walls of the culvert have been built up and some gravel fill placed in back of the wing walls. The timber bulkhead and spillway is in poor condition, and, as stated in a previous report, if the pond is to be maintained at its former level, a good spillway of sufficient capacity and with proper controls should be built as a protection to the roadway and culvert. Under the present condition, there should be proper supervision to keep the spillway and culvert free of all debris.

1951 Oct. 22, E.H.Page, Insp. Went to dam alone. No repairs since last inspection. Water level today: 3.6' below top of 6" x 8" timber. No trash rack here now. Timber work has not been repaired as recommended.

1951 Report to Co. Comm. The dam at Pentucket Pond outlet at Pond Street is formed by the roadway with a timber bulkhead and spillway. The timber work is in poor condition and should be repaired and kept in good condition with an adequate spillway and proper controls as recommended in previous reports. The spillway should be kept free of all debris.

1953 Sept. 29, E.H.Page, Insp. Water level today: 4'4 below top of 6 x 8 timber. Makeshift trash rack has been put here. No repairs on timber work as recommended.

1953 Report to Co. Comm. Pentucket Pond outlet at Poor Street. The timber work of the outlet is still in poor condition and should be repaired. A makeshift trash rack has been installed to keep the spillway clear of debris.

1954, May, E.H.Page & J.O.Harmaala, Insp. There is no trash rack here now. The road makes the dam here so it's fairly safe. There are

PENTUCKET POND
OUTLET

Georgetown D. 1

1941 Sept. 24, C.C.Barker, Insp. I did not see the owners of this dam. Around the outlet the woodwork which holds the stop plank, some of which are in place, is in very poor condition. Also the wing walls of the culvert should be extended upstream to prevent wash of the earth. The dam, roadway surface and culvert is in good condition except as noted. The water level is about 5.5 feet below the road. The culvert is about 4.5 feet deep and 8.5 feet wide.

1941 Report to Co. Comm. Conditions at the outlet from Pentucket Pond at Pond Street are not as good as when I last reported upon that structure. Some of the woodwork is in poor condition and the outlet is of limited capacity as previously noted.

1943 Aug. 30, S.W.Woodbury, Insp. I did not see the owner of this dam. Conditions here are still unsatisfactory as in the past. The walls of the culvert should be extended upstream to prevent the washing out of these walls when the water in the pond is high. The woodwork is in very poor condition, the top 6 x 8 timber being practically gone. The water level today is 4 ft. below the top of the 6x8 top timber. A notch 8" deep has been cut in the top stop plank. There is only a foot of water held back today. Conditions below are the same except that the Newburyport Branch of the B. & M. R.R. has been discontinued.

1943 Report to Co. Comm. Conditions at the outlet, which is of limited capacity, from Pentucket Pond at Pond Street, are unsatisfactory as in the past. The woodwork is very poor and much deteriorated.

1945 Aug. 28, S. W. Woodbury, Insp. I gave a copy of the notice to Mr. G. E. Brown for Mr. Pearson at the Byfield Snuff Mill, and went to the dam alone. Water level today: 3.9' below top of 6 x 8. Water only held back 1 ft. by flash boards. Condition of the dam is the same. Mr. Brown says that he thinks that the Elliott Ice Co. is responsible for half the maintenance of this dam.

1945 Report to Co. Comm. At the outlet of Pentucket Pond, at Pond Street, the roadway which forms the dam is in bad condition and still unsatisfactory, as stated in previous reports. The spillway is of limited capacity and there is a possibility that the road, or dam, would be overtopped in time of a state of flood. The roadway has a hard surface and probably no very serious damage would result.

1947 Sept. 18, S.W.Woodbury, Insp. Went to dam alone. No repairs since last inspection. Waterlevel today: 3.9' below top of 6 x 8 timber. Condition of dam is the same. Mr. Pearson of the Byfield Snuff Co. says that probably the Elliott Ice Co. controls this dam now. Mr. Elliott says that the Elliott Ice Co. does not control the dam. William J. Bleakie and others still own the land at D 2 and have "a certain mill privilege, and all rights of flowage" according to their deed. The Chief of the Fire Department would like to have the level of the water in Pentucket Pond raised and the town maintains a park on the shore of the pond. The town is interested, therefore, in taking control of this dam, if they are successful in getting all parties interested to relinquish all their rights of flowage, etc.

PENTUCKET POND
OUTLET

Georgetown D. 1

little along the course of the outlet for several miles to be damaged. The Newburyport branch of the Boston & Maine Railroad crosses the brook a short distance below the dam on an embankment which might serve to retard such a flood as would follow a break. It is probable that some overflow across the road might occur without serious damage.

1933, Sept. 7. C. C. Barker, Insp. I did not see the owners. The timber work around the gate is in fair condition. The roadway which forms the dam is in good condition. A good macadam has been built on this roadway since the last inspection. The dam is in good shape and conditions are the same.

1933 Report to the Co. Comm. The most important dam in this town is that at the outlet of Pentucket Pond on Pond Street. The road forms the dam and as a structure it seems to be in fairly good condition. The outlet capacity might well be greater but it has been sufficient for many years and the development below it is perhaps not such as to demand that more liberal provisions be provided under present conditions.

1935 Sept. 23, C. C. Barker, Insp. I did not see the owners of this dam. The dam is in good condition except that the timber work around the outlet is rather poor. There is no way of lifting the old gate, only stop plank are used. The roadway forming the dam is in good shape. Today the water level is about 5 feet below the roadway.

1935 Report to Co. Comm. Except that the timber work at the outlet of Pentucket Pond at Pond Street is getting to be rather poor the dam at this point, holding back an important body of water, seems to be in good condition.

1937 July 16, C.C.Barker, Insp. I did not see the owners of this dam. The timber work at the outlet is in fair condition. The roadway forming the dam is in good shape. The water level is about 5 feet below the road. The conditions are the same.

1937 October 18, R.R.Evans, Insp. Looked at this dam and see nothing different from what has been recently reported. With the roadway as it is today there would seem to be less danger from overflow even if the outlet should prove insufficient.

1937 Report to Co. Comm. Pond Street forms the dam at the outlet of Pentucket Pond. The waste way, as previously reported, is of rather limited capacity, but does not seem to be dangerous in view of the width and character of the roadway which apparently would withstand a quite extensive wash across it, and the condition of the structure is fairly good.

1939 Sept. 5, C.C.Barker, Insp. I did not see the owners of this dam. The conditions are the same and there has not been any change. Only stop plank are used to control the height of the pond. The water level is about 5.5 feet below the road.

1939 Report to Co. Comm. The outlet from Pentucket Pond is at Pond Street which forms a dam. The area of the pond and its watershed is large and the spillway has a very limited capacity. It is probable that under conditions which may occur the water will flow over the road, but the road is wide and of a semi-permanent type which should protect it so that there would be no serious washout. It is, of course, evident that the spillway should be sufficient in itself to avoid any possible overtopping.

PENTUCKET POND
OUTLET

Georgetown, D. 1

1917, March 26. Watershed 8. sq. m. Max. Ht. 7.5 ft. Apparent condition, Good.

1925, Nov. 11. R. R. Evans, Insp. The road (Pond Street) forms the dam at this point. It is some six or seven feet higher than the bed of the brook below. There is a wooden waste way and gate at the head of a stone culvert crossing the road about eight feet wide and four and one-half feet high. The total spill way is ten feet wide and about one foot high, and there is a three foot by four foot gate. Before the water reached the level of the road the over-flow capacity around the spill way would be considerably increased without damage. The water shed above this point is about eight square miles and there are two large ponds which regulate the flow.

1925 Report to Co. Comm. Same as above.

1929, Nov. 12. C. C. Barker, Insp. In case of failure the only damage that would probably occur would be to the street, as there is a rather flat woody valley below the dam. The street forms the dam, there is merely a gate across the culvert. The dam is in fair condition, except that some of the stones on the upper side have fallen away, and the road needs filling out on the upper side. With the pond full and a strong wind, the waves are quite apt to wash out the road around the spillway. The conditions are the same and there have been no changes since the last inspection.

1929 Report to Co. Comm. The dam at end of Pentucket Pond is of some importance and there is some possibility of damage in case of failure. This dam which is formed by the street, is in fair condition, and the examination did not disclose any necessity of immediate repairs.

1931, Oct. 8. C. C. Barker, Insp. The gravel roadway forming the dam has been raised about 6 inches and shaped out, and is in good condition. The timber bulkhead and gate across the culvert is in fair condition. Since the last inspection there have been no changes and conditions are the same.

1931, Nov. 4. R. R. Evans, Insp. The dam is substantially the same as at the last inspection. There is no spillway except one bulkhead and the gate seems to have proved sufficient in the past as a means of lowering the water level. Presumably a considerable over-flow across the road might not do damage for some time, and the development of the country for along distance below is such that serious damages are not to be expected, even from a failure of considerable extent. There should be a spillway and the dam should be raised to be safe from any reasonable possibility of over-flow.

1931 Report to Co. Comm. At the easterly end of Pentucket Pond on Pond Street there is a dam controlled by the Eyfield Snuff Company. The road constitutes the main dam and the surface has been raised some six inches recently. There is an outlet culvert closed by a timber bulkhead with a gate in it and a spillway of limited capacity over this bulkhead. These means for controlling the height of the pond have apparently proved sufficient in the past although the area of the water shed above the dam would seem to indicate that the total discharge capacity should be greater. The dam holds back a large body of water, capable of doing much damage if released suddenly although there is

COUNTY OF ESSEX, MASSACHUSETTS
ENGINEERING DEPARTMENT

Inspection of Dams, Reservoirs, and Stand Pipes

01075

SUB NUMBER

D. / R. S. P.

Neg. Nos. 1152-1

Inspector C. C. Barker Date Nov. 19, 1913 *Classification 2

City or Town Georgetown Location Easterly end of Pentucket Pond on Pond St.

Owner Controlled by Byfield Woolen Mill Use Storage
Include such details as cores, cut off walls, paving, sodding, class of masonry, kind of cement, (nat. or port.) etc.

Material and Type It is merely a gate across the culvert in the road.
The culvert is 58' 9" stoned sides and bottom.

Elevations in feet: above (+) or below (-) full pond or reservoir level. (Cross out what does not apply.)

For Dam
Bed of stream below..... Bottom of pond..... Bottom of spillway..... Top of dam..... Top of flash boards.....

For Res. or S. P.
Ground surface below..... Bottom of res..... Level of over flow pipe..... Top of res.....

For dam
Length in ft. 400± Top width in ft. 10± Pond area 50± acres Area of watershed 8± sq. mi
For Res. or S. P.

Inside dimensions..... Capacity..... Covered..... open

Length of overflow or spillway..... Outlet pipes (size and nature).....

Stand pipe, thickness at base..... diam. of rivet head..... Pitch the

Foundation and details of construction.....

Constructed by and date.....

Recent repairs and date.....

Evidence of leakage Slight

Condition Good S. P. when pointed that

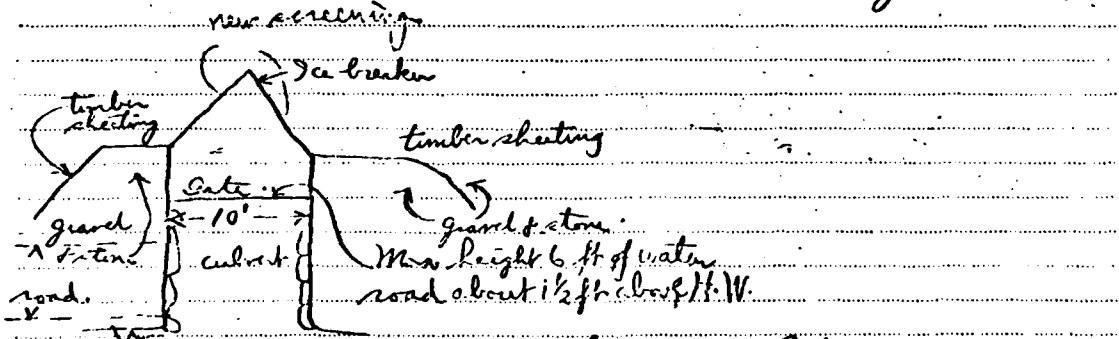
Topography of country below Flat land

Nature, extent, proximity, etc. of buildings, roads or other property in danger if failure should occur. None except to culvert.

Plans and data secured or available.....

Use separate sheet for sketches if necessary.

Notes, sketches, sections, etc. The road is 20' wide and 5' high.



No change. Inc. Oct. 24, 1916. Q.E.W.

*Classify as to probable damage in case of failure. 3 slight. 2 mod-rate. 1 serious.

PENTUCKET POND
OUTLET

39. Miles I

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passed, brought about by discussions pro and con, that \$1,500.00 was not enough money, that the \$3,000.00 specified in the article was necessary—an amendment was then offered that the Town raise and appropriate the sum of \$3,000.00 for Dutch Elm Disease Control; the motion for \$1,500.00 originally made was defeated, as well as the amendment requesting \$3,000.00 No Dutch Elm money this year. (The Beatles will have it made in Georgetown.)

ARTICLE 11. To see what sum of money the Town will vote to raise and appropriate to be added to the existing "Rebuild the Flume at the Easterly End of Pentucket Pond Account," Article 21, Town Meeting of March 4, 1963.

Motion made by Joseph A. Soucy and seconded by Barney A. Camenker: Moved that the sum of \$3,000.00 be raised and appropriated, this sum to be added to the existing "Rebuild the Flume at the Easterly End of Pentucket Pond Account" of \$2,202.20. There was much discussion. Roger Soucy, Barney Camenker, Bruce Andrews, Charles Blanchard and Mrs. Natalie Severance—all contributing to why and wherefores—the voters were evidently receptive, for the motion carried. It is voted.

ARTICLE 12. To see if the Town will vote to continue the Road Machinery FUND.

Motion made by Joseph A. Soucy and seconded by Barney A. Camenker: Moved that the Town vote to continue the Road Machinery Fund. It was voted.

ARTICLE 13. To see if the Town will vote to appropriate by transfer the sum of \$1,000.00 from the Road Machinery FUND to the Road Machinery ACCOUNT.

Motion made by Joseph A. Soucy and seconded by Barney A. Camenker: Moved that the Town vote to appropriate by transfer the sum of \$1,000.00 from the Road Machinery Fund to the Road Machinery Account. It was voted.

ARTICLE 14. To see if the Town will vote to authorize the Assessors to use a sum of money from the Excess and Deficiency Account in determining the 1964 Tax Rate.

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ARTICLE 19. To see if the Town will vote to approve of the acquisition and use by the proprietors of Harmony Cemetery in accordance with General Laws, Chapter 114, Section 34, of a certain parcel of land located on Central St.

Motion made by Robert Metcalf, Atty.-at-Law and seconded by Benjamin H. Tidd, that the proprietors of Harmony Cemetery be permitted to use for burial purposes the land it has recently acquired extending Southerly along Central Street from the present cemetery to land of Mr. and Mrs. Flanagan and extending back from Central Street to a brook. There was some discussion on this. Town Counsel Mr. Rudolph rendered some opinions; evidently the voters were satisfied; by a voice vote it was so voted.

ARTICLE 20. To see if the Town will vote to raise and appropriate or appropriate by transfer from available funds, the sum of \$140.00 to provide the Conservation Commission with a budget for the ensuing year.

Motion made by Mr. Soucy and seconded by Mr. Morse: That the Town raise and appropriate the sum of \$140.00 for a departmental budget for the Conservation Commission for the year 1963. This was voted.

ARTICLE 21. To see what sum the Town will vote to raise and appropriate or appropriate by transfer from available funds for the purpose of rebuilding the Flume at the Easterly end of Pentucket Pond.

Motion made by Mr. Morse and seconded by Mr. Soucy: That the Town raise and appropriate the sum of \$2,500.00 to do all things necessary to rebuild the Flume at the Easterly end of Pentucket Pond.

Mr. Roger Soucy, member of the Conservation Commission, gave a satisfactory explanation regarding this article. The Moderator called for a vote; it was voted.

ARTICLE 22. To see if the Town will vote to raise and appropriate or appropriate by transfer from available funds the sum of \$2,000.00 to establish a new children's room in the Peabody Library, or take any other action relative thereto. Submitted by the Trustees, Peabody Library.

PENTUCKET POND
OUTLET

1950 ITEMS

Annual Town Meeting, March 6, 1950, Baker Adams, Moderator.

Robert Metcalf spoke favorably on behalf of Finance Committee and Water Commissioners for extension of water on King Street, using unexpended balance from Thurlow Street project and appropriation of \$2000. Also of opinion Warren Street rates next for water but until highway situation on Tenney, Jewett and Jackman Streets becomes definite, action in their vicinity should remain in abeyance, finally expending about \$20,000 a year till approximately \$62,000 project developed.

Voted \$15,000 for highway; State's portion \$10,175.

For highway maintenance \$3,000. State's portion \$1,000. Under Chapter 90, \$8,000. State's portion, \$6,000.

Essential votes on street lighting, assessment of taxes, borrowing power of Town Treasurer and petition by Selectmen for State money.

Voted \$1,500. to widen one bridge on Mill Street.

Voted pay of Assessors be 75c per hour and that Highway Surveyor and Tree Warden may labor in respective departments at \$1.25 per hour.

Selectmen given power to regulate removal of soil, loam, sand and gravel.

Voted \$3,500 for new toilets in boys' basement at Central School.

Barney A. Camenker conveyed to Town of Georgetown all water rights in Parker River and branches.

Universal gratitude expressed by folks of Georgetown for efficient management of Municipal Light Department.

Perambulating town bounds occurred as must be every fifth year.

Present population 2493.

Registered voters 1359.

PENTUCKET POND
OUTLET

Article 5. To see if the Town will authorize the selectmen to petition the state for a portion of the sum available under the provisions of Sections 26, 27, 28 and 29, of Chapter 81, General Laws, Tercen. Edition, as amended. to be appropriated and expended by and under the direction of the Department of Public Works, Division of Highways, in accordance with the provisions of said statute.

Article 6. To see if the Town will vote to raise and appropriate a sum of money for highway maintenance under the provisions of Chapter 90, General Laws, said money to be used in conjunction with any money which may be allotted by the State and County for this purpose.

Article 7. To see if the Town will vote to raise and appropriate a sum of money for highway construction under the provisions of Chapter 90, General Laws, said money to be used in conjunction with any money that might be allocated by the State and County for this purpose.

Article 8. To see if the Town will continue the Road Machinery fund.

Article 9. To see what sum of money the Town will vote to transfer from the Road Machinery fund to the Road Machinery Account.

Article 10. To see if the Town will vote to raise and appropriate \$100.00 to pay engineering services to reserve for the town the water rights in the Parker Brook and Penn Brook Canal.

Article 11. To see what sum of money the Town will raise and appropriate to widen one bridge on Mill Street.

Article 12. To see if the Town will vote to place 3 street lights on Jacobs Road.

Article 13. To see if the Town will adopt the Regulations Establishing the Minimum Standards of Fitness for Human Habitation, as prepared by the Department of Public Health acting under the provisions of Section 128 of Chapter 111 of the General Laws, as amended by Chapter

468 of
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COMMONWEALTH OF MASSACHUSETTS

Essex, ss.

County Commissioners

July 28, 1964

The Board of Selectmen of the Town of Georgetown, Massachusetts, by their letter of July 27, 1964, signed by Barney A. Camenker, Chairman, requests approval of a supplemental plan showing proposed fishway to be incorporated into the Pentucket Pond Outlet plan, Record No. 2971, which was approved by the County Commissioners on August 28, 1963.

The plan was prepared by Charles H. Morse and Son, Engineers, Haverhill, Massachusetts.

The Commissioners have considered the above request and the plan with specifications thereon, and the site of the proposed structure has been investigated by their engineer.

It appears that the size and details of the proposed improvements are satisfactory, and the plan and specifications call for a safe structure. The plan with specifications thereon is, therefore, hereby approved and filed herewith, plan bearing Record No. 2982, being deposited in the office of the County Engineer. This approval is given subject to any and all further approvals by state, town or other authorities which may be required by law. The Commissioners reserve the right to pass further upon material used and details of construction as they deem necessary during the progress of the work, and the petitioner is required to give ample notice and opportunity for inspection of the work by the Commissioners or their agents.

IN WITNESS WHEREOF, we have hereunto set our hands this twenty eighth day of July in the year of our Lord One thousand nine hundred and sixty four.

Daniel J. Burke

Edward H. Cahill

C. F. Nelson Pratt
County Commissioners

A true copy.

Attest:

Barbara C. Chapman
Deputy Asst. Clerk.

C-6

April 15, 1963

To: The Honorable Board of Selectmen

Gentlemen:

It has been recommended to the commission that the dam be set at elevation 76.93 feet.

In talking with representatives of the U.S. Soil Conservation Service, the commission has learned that an engineer from the service will stake out the dam site and provide certain supervision on construction, along with aiding the builder in going over the plans. Further, the engineer will provide the necessary plans and sketches if the proposed dam structure must be taken before the state division of waterways for a public hearing.

As you undoubtedly know, the county commissioners will have to examine the plans before work is started on the project.

The Soil Conservation Service has requested a written release signed by the selectmen, wherein it cannot be held liable for any damage that might occur in the future as a result of the new dam.

If you wish to have the soil conservation service furnish the above work, please let us know so that the service can be contacted and arrangements made to carry out the work.

Signed:

Georgetown Conservation Commission

PENTUCKET POND
OUTLET

COUNTY OF ESSEX
OFFICE OF COUNTY ENGINEER
COURT HOUSE, SALEM, MASS.

CLINTON C. BARKER
COUNTY ENGINEER

August 13, 1948

Mr. Barney A. Camenker, Chairman
Board of Selectmen
Georgetown, Massachusetts

Dear Sir:

I enclose herewith photostat
copies of correspondence regarding
Pentucket Pond Dam on Pond Street in
Georgetown.

Yours truly,

Clinton C. Barker
County Engineer

0-2

B-21

PENTUCKET POND
OUTLET

G. KATZMANN
HEY
1910-1934
DRAY
W. BISSE

KATZMANN, VAHEY & DRAY

ATTORNEYS AT LAW

HYDE PARK 36, MASSACHUSETTS

TELEPHONE
HYDE PARK D377

November 22, 1947

Clinton C. Barker, County Engineer
Court House
Salem, Massachusetts

Dear Sir:

Replying to your letter of November 17th in
regard to Georgetown property.

I regret to inform you that the trust under the
will of Robert J. Bleakie has long since been closed out,
and there are no assets whatever in the hands of the trustees.

Very truly yours,

F. G. Katzmnn
F. G. Katzmnn

B-22

PENTUCKET POND
OUTLET

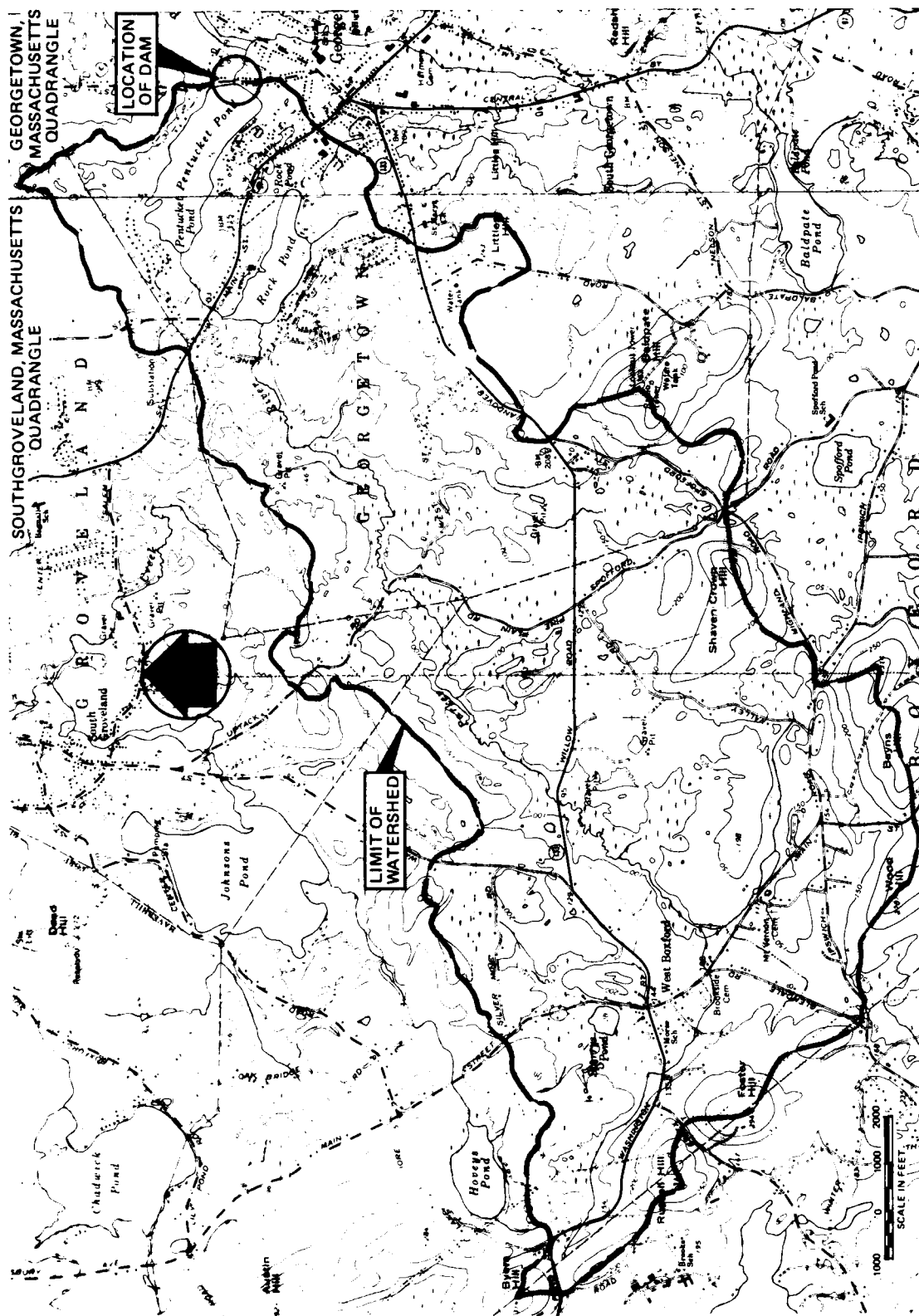


FIG. D-1 DRAINAGE AREA MAP - PENTUCKET POND DAM

APPENDIX D
HYDROLOGIC AND HYDRAULIC
COMPUTATIONS

Figure D-1. Drainage Area Map
Computations

Page

D-1

D-2

PENTUCKET POND



**NO. 9 DOWNSTREAM CHANNEL AND OPENING IN ABANDONED
RAILROAD EMBANKMENT ABOUT 500 FEET DOWNSTREAM OF POND**



**NO. 10 STAFF GAUGE ON PARKER RIVER BETWEEN ROCK POND
AND PENTUCKET POND VIEW FROM WEST MAIN STREET**



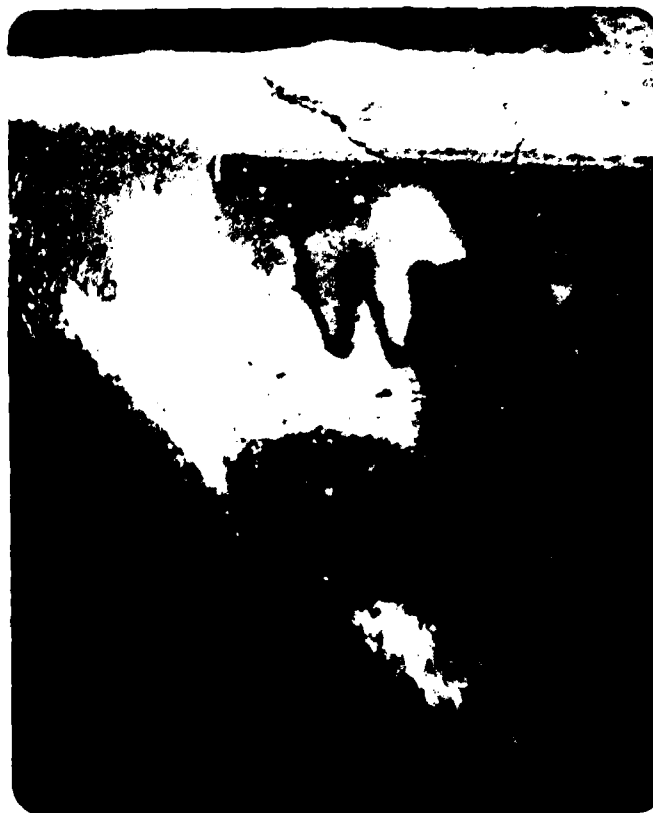
NO. 7 VIEW OF DOWNSTREAM CHANNEL
FROM POND STREET BRIDGE



NO. 8 VIEW OF SWAMP DOWNSTREAM OF OUTLET



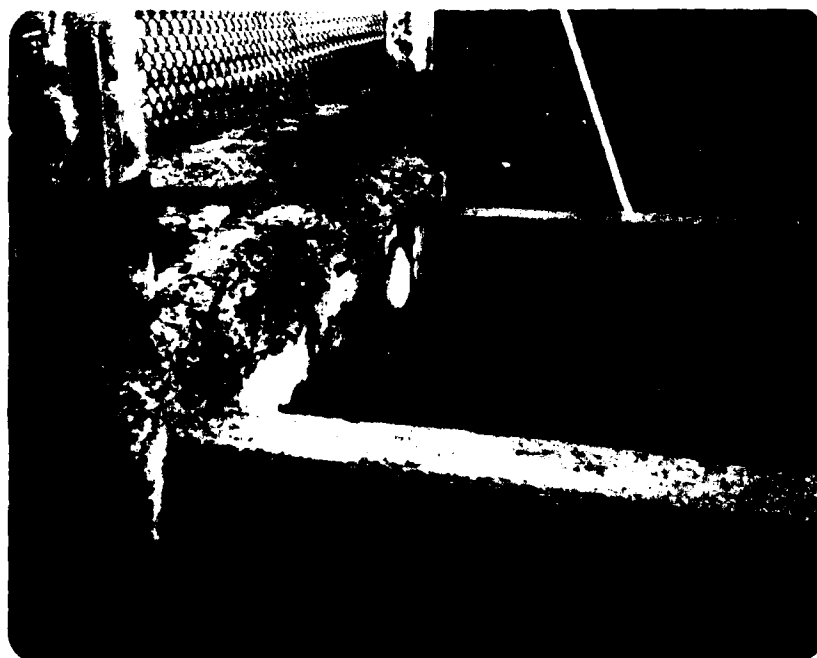
**NO. 5 DETERIORATED CONCRETE AT NORTH
TRAINING WALL, UPSTREAM END OF THE OUTLET**



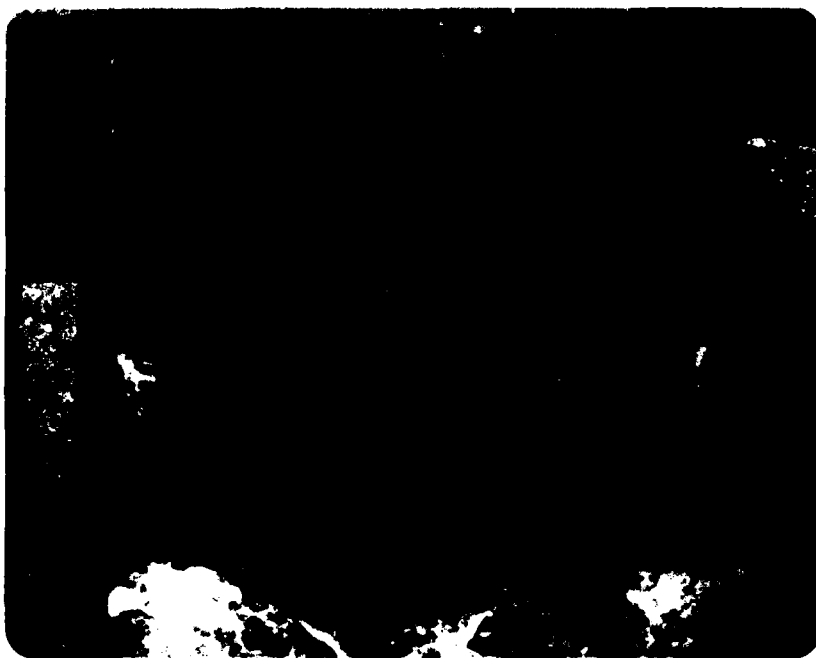
NO. 6 CRACKS IN NORTH TRAINING WALL AT UPSTREAM END OF OUTLET



**NO. 3 CREST AND UPSTREAM SLOPE; NOTE
CRACKS IN POND STREET PAVEMENT**



**NO. 4 UPSTREAM BRIDGE DECK FACIA AT OUTLET; NOTE
DETERIORATION AND EXPOSED REINFORCING STEEL**



NO. 1 UPSTREAM VIEW OF SPILLWAY



NO. 2 FISH LADDER ADJACENT TO SOUTH TRAINING WALL

APPENDIX C

PHOTOGRAPHS

(For location and direction of view of photographs,
see Figures B-1 and B-2).

PENTUCKET POND

a precedent, the result of which has been the permanent flowage of these lands, or sufficiently so, as to make them valueless.

About 1853 Hon. Messrs Tenney bought and enlarged the mills, adding improved machinery at a large expense. Many were hoping when the purchase was made, that the intentions were to remove the entire structure, and thus give unobstructed passage to the vast body of water which flowed or would flow, if unchecked, through the central and southern part of the town but their hopes were doomed to disappointment. About five years ago, the property changed owners, and the manufacture of blankets was begun, with an enlargement of the buildings. Under the present competent management, the production is largely cashmere. There are about fifty employees, with Edward C. Aldrich as superintendent, and the corporation name is the "Parker River Mills". Returning to the last century we find other industries — — — — —

The following was copied at the Essex Institute
in Salem Mass:

- History of Essex County - Compiled under the
Supervision of D. Hamilton Thurd Vol. I.
Philadelphia J. W. Lewis & Co. 1888.

Page 843 Chapter LVIII

- About 1740 Daniel Pierce, perhaps the
grandfather of the late Major Daniel Pierce,
commenced digging a canal below Pentucket Pond,
preparatory to the erection, or possible enlargement,
of a mill already in operation and a site now
occupied by the Parker Woolen mills. The
interest that Pierce had was soon sold by him,
the purchaser running a grist-mill, which for
a century, was in use from the middle of October
to the middle of April of each year. -----

- In 1807 John Wood, who lived near by, was
the owner, and added a saw-mill. Paul Stickney
was at one time the proprietor, and also Major
Paul Wole, for more than twenty years. About
1851 or 52, money was raised by subscription,
land damage paid; the meadow around Pentucket
Pond flowed through the year, and the mill was
run constantly during the summer months. This was

PENTUCKET POND
OUTLET

BENJAMIN PEARSON, Presr. Mgr.
JOHN T. LITCH, Vice Pres.

ESTABLISHED 1804

F. T. C. HALE, Treas.
G. B. LITCH, Sec.



Sept 11, 1945.

Mr Clinton C. Barker, Ass't County Engineer.
Court House,
Salem, Mass.

Dear Mr Barker,

Your examining engineer, Mr Woodbury, has reported to us through an employee that the dam and gate structure at the foot of Pentucket Pond in Georgetown is in need of some repairs on the sluice and gate.

This water right is not our property and we cannot give you the names of the present owners, but I believe that they are the heirs of the former mill owner who operated just below the pond. I think it was the "Georgetown Mills".

We did operate the gates a long time ago on a verbal permissive basis and in our own interests did make some repairs. We have not had any interest for a long time now and the last people interested were the people operating the ice house. I believe that they did make some minor repairs in order to keep a pond for ice cutting.

We are not interested and have no ownership or agency from the owners.

Sincerely yours,

Byfield Snuff Co.,

Benjamin Pearson
President.

B-26

PENTUCKET POND
OUTLET

TOWN OF GEORGETOWN



TOWN OFFICE

GEORGETOWN, MASS.,

October 7, 1947

County Engineer
Salem
Massachusetts

Dear Sir:

This is to notify you that the flume which controls the waters of Pentucket Pond at the outlet thereof on Pond Street in Georgetown is in a dangerous condition. A large section of the road is in danger of being undermined.

The Selectmen of Georgetown have been told by those who use the waters that they will do nothing about the situation.

Notification is given you inasmuch as your office has jurisdiction over all dams etc.

Sincerely,

For the Selectmen.

Edwin Adams

PENTUCKET POND
OUTLET

B-25

November 17, 1947

Mr. Baker Adams, Chairman
Board of Selectmen
Georgetown, Massachusetts

Dear Sir:

Replying to your letter of October 7, 1947, in regard to Pentucket Pond dam and outlet at Pond Street, the dam is formed by the roadway which is in good condition and maintained by the town, except at the outlet at the head of the culvert there is a timber bulkhead and spillway which formerly had a gate that could be operated by a lever to control the flow and keep the pond at a certain elevation, and proved satisfactory when under the control of the Byfield Snuff Company.

In the past several years, the Byfield Snuff Company has not had any interest in this dam and does not control it now. Consequently, without any supervision, the conditions have been getting worse, and now the timber work has deteriorated and the wing walls of the culvert next to the timber work are in very poor condition and should be repaired, also backed up with gravel fill and riprap to protect the embankment around the culvert.

If the pond is to be maintained at its former level, a good spillway of sufficient capacity and with proper controls should be built as a protection to the roadway and culvert. If this is not done, the old timber should be removed and the pond drawn down so that the culvert will not become blocked with debris and cause the water to overflow the road (known as Pond Street).

Our best information is that the flowage rights belong to Robert Bleakie Heirs in the names of William J. Bleakie, George H. Whiting and Frederick J. Katzmahn, Trustees. Assessors send tax bills to Frederick J. Katzmahn, 1219 River Street, Hyde Park, Massachusetts.

Byfield Snuff Company has no interest in pond or water right as shown by photostatic copy of letter September 11, 1945, enclosed.

I understand the town desires to have full control of this pond with all water rights and rights of flowage, and see no reason why the town should not repair the embankments around the head of the culvert to protect the roadway and culvert.

I will contact Mr. Katzmahn and try and find out whether they still have any interest in the dam, and will make the necessary repairs.

Yours truly,

County Engineer

PENTUCKET POND
OUTLET

ECB/O-2

B-24

November 17, 1947

Mr. Frederick G. Katzmann
1219 River Street
Hyde Park, Massachusetts

Dear Sir:

From the latest information obtainable, I understand that you are one of the trustees for the estate of William J. Bleakie, having the control of all flowage rights on Pentucket Pond and the dam at its outlet on Pond Street, Georgetown.

Under Section 45, Chapter 253 of the General Laws, as often as once in two years an examination of certain reservoirs and dams is made as to the safety and condition of each structure, as far as possible in cooperation with the owner or his agent, as a basis for a report to the County Commissioners.

The woodwork forming the spillway at the outlet at the head of the culvert has deteriorated and is in very poor condition, and the spillway should be repaired if the pond level is to be maintained, or if not repaired the woodwork should be removed to prevent a possible stoppage of the culvert.

Will you kindly advise me if you have control of the dam and water rights and will make the necessary repairs, or, if not, can you refer me to the proper parties?

An early reply will be appreciated.

Yours truly,

County Engineer

PENTUCKET POND
OUTLET

CCB/0-2

B-23

1947

I Test Flood, Storage & Storage Functions

1- Total Drainage Area - 7.5 mi²

2- Pond(s) Area: $.08 + .01 + .01 = 0.10$ mi²
 Swamp(s) Area: $5(.03) + 3(.02) + 3(.04) + 2(.05) + .01 + .09 + .07 = 0.72$ mi²
Total Area Pond(s) & Swamp(s): 0.82 mi²

% Ponds & Swamps = $\frac{0.82}{7.5} = 11\%$

3- $\frac{310 - 75}{28600} = .008217$ } Say Ave Slope = 0.8%

4- Using C. of E. Curves for Peak Flow Rates & above guide values the Peak Flow Rate was estimated to be slightly higher than the C. of E. and taken at 600 c.f.s./mi²
 Size Class: Small ; Hazard Pot.: Signif. ; Spill. Des. Flood: 100yr to 1/2 PMF
 Use: Test Flood = 1/2 PMF

5- Test Flood Inflow = $\frac{1}{2}(600) 7.5 = 3000$ c.f.s.

6- Pond Storage

The pond area is 0.13 sq. mi. at elev. 75± (U.S.G.S.)
 Based on a const. area, storage increases at 84.9 ac. feet per foot of depth increase.

7- Spillway crest elev. is 77.0 (Fish ladder crest is 76.6)

8- Storage Functions are based on $Q_{out} = Q_{in} [1 - \frac{S_{out}}{R}]$

S_{out} = Storage Vol. in Reservoir related to final Q_{out} in terms of inches of rain over the drainage area.

$S(\text{in Inches}) = 12 D \left(\frac{0.13}{7.5} \right) = 0.208 D$; $R = 6\text{hr rain of storm}$

D = Storage depth in feet above spillway crest in reservoir

9- Storage Functions: (Test Flood & 1/2 PMF - if needed)

$F_{TF} = 3000$	$- 45.8 S$	$S = 3000 - 65.7 D$
$F_{1/2 PMF} = F_{TF}$	$-$	$S = - D$

Project Nat. Review of Non Fed. Dams Acct. No. 6356 Page 2 of 4
 Subject Essex County, Mass Comptd By LEE Date 6/5/79
 Detail FENTUCKET (DND) Ckd By [Signature] Date 6/21/79

II Discharge Relations

A - Fish Ladder

Crest Length 1.8 ft. @ el. 76.6 - Use Williams & Hazen "Hydr. Tables" p. 30

Pond El.	77	78	79	80	81	82	83	84	85
Q	0.87	5.48	12.24	20.63	30.42	41.47	53.26	65.05	76.84
Q_A	0	10	20	40	50	70	100	120	140

B - Spillway

Crest Length 6.5 ft @ el. 77.0 - Ogee crest - Use $Q = 3.9(6.5)(H)^{1.5}$

Pond El.	78	79	80	81	82	83	84	85
Q_B	30	70	130	200	280	370	470	570

C - Crest

100 ft @ 81.8 (L.P.); 90 ft @ 82.4, 60 ft @ 83.2

Note: Low crest levels near Mill St. not included since high water there would pond, but not clearly discharge downstream.

Use $q = 2.55 H^{1.5}$ [Ref: V.T. Chow pg 52-53]

Pond El.	82	83	84	85
Q_1	20	340	830	1460
Q_2	-	110	460	960
Q_3	-	-	110	370
ΣQ_c	20	450	1400	2790

III Crest Flow

T.P. Pond El. = 84.4

L.P. Crest = 81.8

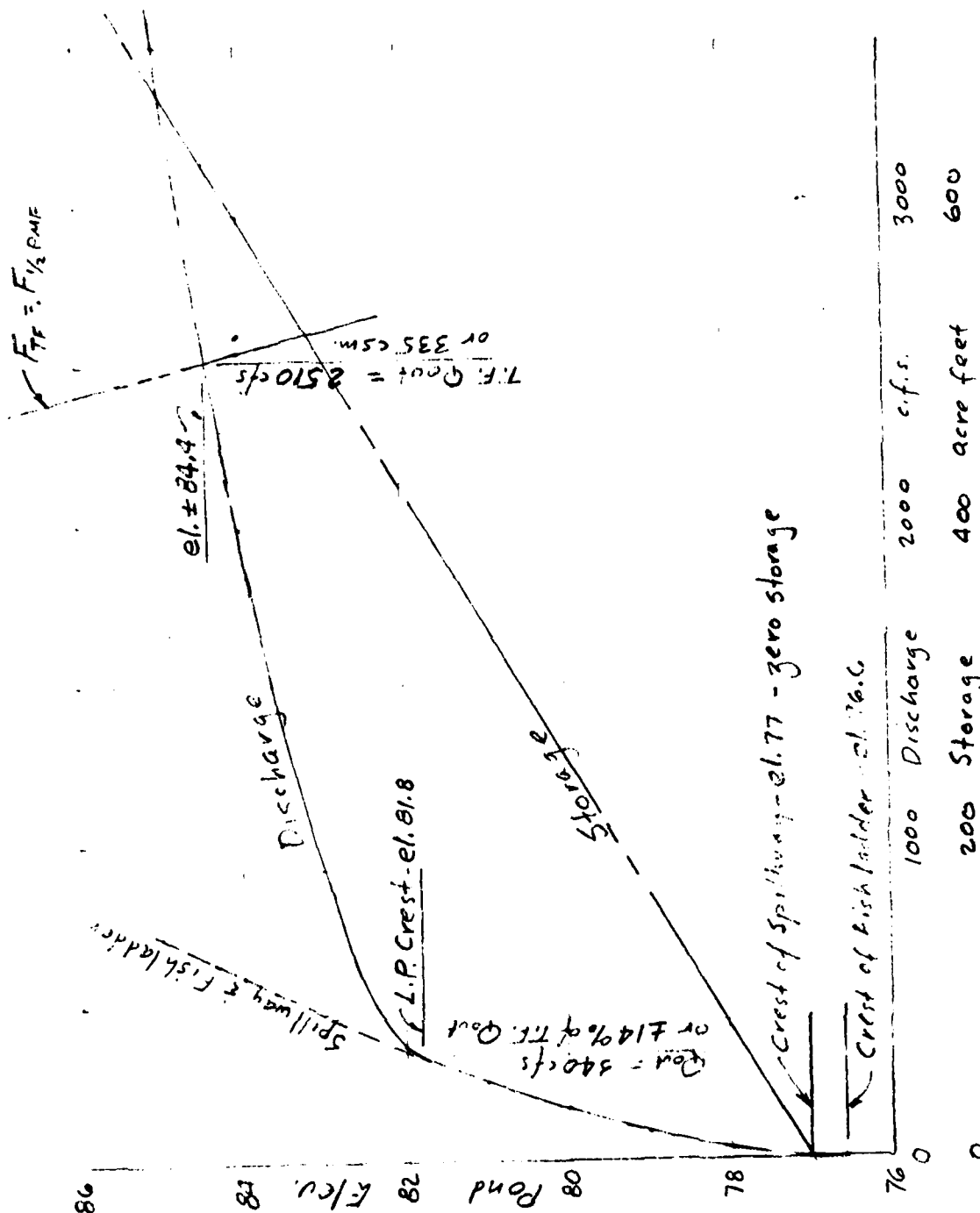
Max Hd on Crest = 2.6 ft.

$$q = 2.55 (2.6)^{1.5} = 10.7 \text{ cfs/ft}$$

As Critical Flow: $y_c = 1.53 \text{ ft}$; $V_c = 7.0 \text{ fps}$

Project Nat. Review of Non Fed. Dams Acct. No. 6356 Page 3 of 4
 Subject Essex County, Mass Comptd. By LEB Date 6/5/79
 Detail PENTUCKET POND Ckd. By (Signature) Date 6/21/79

IV Discharge, Storage & Storage Function vs Pond Elevation



V Failure of Dam

Peak Failure Flow:

Pond Elevation - 81.8 (L.P. Crest)

Toe Elevation - 74.2

$$Y_0 = 7.6 \text{ ft}$$

Dam Length Subject to Breaching = 150 ft

$$W_0 = 40\%(150) = 60 \text{ ft}$$

$$Q_R = 1.68 W_0 (Y_0)^{1.5} = 1.68 (60) (7.6)^{1.5} \approx 2100 \text{ cfs}$$

Ongoing ditch = 340 cfs. Say total disch. $\approx 2400 \text{ cfs}$.

Storage Volume Released:

Storage Above Spillway $4.8 (84.9) = 410 \text{ ac. ft}$

Storage Below Spillway $2.8 (9^2 - 84.9) = 210 \text{ " "}$

$S = \text{Total Storage} = 620 \text{ " "}$

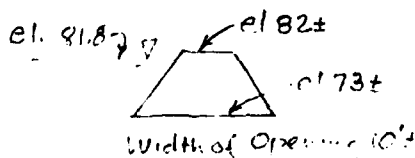
Channel Hydraulics:

I. Immediately Downstream:

150 ft \pm rect. waterway, $n = .05$, $S = \frac{0.7}{240}$, $R \approx y$, $V = 1.6 y^{2/3}$

$Q = 150 (1.6 y)^{2/3}$; For $Q = 2400 \text{ cfs}$, $y \approx 4 \text{ ft}$.

II. Restriction @ Abn. N.R. Embankment



Assume intermediate area rapidly
 reduced to small level. Discharge @
 restriction relates to critical depth
 at restriction

$$E = 3.8 \text{ ft}; y_c = 5.87; \frac{V_c^2}{2g} = 2.92'; V_c = 13.7 \text{ fps}$$

$$Q_c = 10 (13.7) (5.87) = 810 \text{ cfs}$$

Note: This rate should decrease
 as backwater develops

III. Mill. St. Culverts

(A) 11.5' \times 5' \times 11.5' (B) 8.6' \times 1' \times 5.75' high Use M.T. Chow - Fig. 17-29
 Assume both culverts have same invert elev.

H/d	1.0	1.25	0.9
q	41	52	36
Q	824	1045	724

Culverts appear able to handle peak flow
 without over topping street.

Time to Drain:

$$\frac{43560 (620)}{3600 (1/2) (810)} = 18.5 \text{ Hours.}$$

APPENDIX E

INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY
OF DAMS

PENTUCKET POND



INVENTORY OF DAMS IN THE UNITED STATES

IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGRESS DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
MA 261	NED	MA	009	06	PENTUCKET POND OUTLET	4243.8	7059.5	19JUL79

POPULAR NAME	NAME OF IMPOUNDMENT
	PENTUCKET POND OUTLET

REGION/BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM DAM (MI.)	POPULATION
01 06	PARKER RIVER	GEORGETOWN	0	5900

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STATUS	HYDRAULIC	IMPOUNDING CAPACITIES
REPG	1850	R	8	8	620

DIST OWN FED R PRV/FED SCS A VER/DATE
NED . N : N N : N

REMARKS
22-ESTIMATED

ID/S HAS	SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY (MW)	INSTALLED	PROPOSED	NAVIGATION LOCKS
2	250 U	8	330	4000			

OWNER	ENGINEERING BY	CONSTRUCTION BY
TOWN OF GEORGETOWN	UNKNOWN	UNKNOWN

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
METCALF AND EDDY INC	16APR79	PL 92-367

REMARKS
32-SPILLWAY PLUS FISH LADDER

END

FILMED

7-85

DTIC